Professionalisation of Engineers

Held on: April 30- May 1, 2003
Venue: India Habitate Centre, New Delhi

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1. THE INAUGURAL SESSION

1.1 Welcome: Dr. Uddesh Kohli

It is indeed a great privilege to welcome the Chief Guest, Shri. K.C. Pant, who is also the Patron of ECI. In fact, it is on his initiative that the ECI was formed. We welcome Dr. R.A. Mashelkar, who has been a source and strength to engineers, scientists and other technical people.

ECI is a year old, it was formed on 4th April 2002, by coming together of the 24 Engineering Associations and other engineering bodies, including the Institution of Engineers, which played an important role.

The objective and purpose of ECI is to promote the Engineering Profession and bring Code of Conduct, accountability and standards to match the World so that we could also ensure the mobility of engineers in international field. The Council formed several committees and has completed many reports based on the system of registration of professional engineers, which will be discussed in the Board Meeting this evening and the registration process will commence soon. Deliberations at the conference today are on the:

1. Issues facing the Engineering Profession.
2. Emerging International Scene.
3. Role of Professional Societies.
4. Role of Industry, Corporate/ Government/ Consulting Engineers/ Universities/ Financial Institutions/ Education and Research Institutes, etc.

All these topics will help us in many ways in improving the conduct of ECI in the coming years.

1.2 Opening Address: Prof. Ashoka Chandra

Let me, at the outset, extend to you a warm welcome at the Inaugural Session of the First National Conference on Professionalisation of Engineers being organized by the Engineering Council of India. I am most grateful to you, Shri Pant ji, for agreeing to be with us this morning at the first major public event of ECI. Your presence here is a tremendous source of inspiration to us. It also signifies your commitment to the cause of engineering profession and support to the Engineering Council. Let me also welcome Dr. R.A. Mashelkar, who is among the foremost engineers of the country and a leader of the movement of 'learning to dare and daring to learn' in the engineering community.

Dr. Uddesh Kohli is Member Secretary, Engineering Council of India. He is the Chairman Consultancy Development Centre, the President of All India Management Association, and President Emeritus of Indian Society for Training & Development (ISTD). He is also the Chairman, Construction Industry Development Council. Recently, he received the Eminent Engineer Award conferred by the Institution of Engineers (I), Delhi State Centre.

Prof. Ashoka Chandra, is the Chairman, Engineering Council of India, Chairman of Indian Association of Social Science Institutions, and National President of Indian Society for Training and Development. As Secretary, Government of India for 12 years, he headed the entire national system of technical education: Engineering, Technology, Management, Town Planning, Architecture, Applied Arts, Pharmacy. Honours and Awards received by him include "Eminent Engineer" award of Institute of Engineers (I) and Platinum Jubilee Gold Medal of Institute of Mechanical Engineering.

I refer to the rationale for setting up of ECI and the role of member associations. In all other major professions in India, quality and accountability are ensured by their respective Acts while engineers, who have the largest numbers, did not have an Act for their profession. The purpose of such an Act is to raise the professional standard with due emphasis on ethics of professional conduct. Persistent efforts and a series of consultations among professional societies and others over a long period led to the formation of ECI. It is a unique feature of ECI as a regulatory body that it has been constituted by professional societies and functions on their support.

The registration system of engineers and consultancy organizations is being evolved in consultation with member associations and it is proposed to be implemented through the member associations themselves. A crucial step in the development of ECI's programmatic and institutional strategy is strengthening its linkages with its members.

The prime objective of the registration system is to establish and recognize the expertise of engineers. It is also intended to ensure through the registration system that engineers shall upgrade their knowledge and skills by pursuing systematically, a programme of continuing professional development throughout their working career. In order to infuse accountability in the work of engineers, a code of ethics will be enforced for ensuring integrity in professional work. Registration with ECI will be voluntary to start with. Once the Engineers Act is passed by the Parliament, such registration will become mandatory. We earnestly believe that the work of ECI will make a significant contribution to national development by improving the quality of delivery of engineering services in all sectors of the economy.

Policies and programmes of education, competency development and utilisation of engineers have been based so far on issues internal to the economy. In the registration system being developed by ECI, in addition to integrating quality and accountability in the profession basically for the domestic economy, we should also address our interests and compulsions under such agreements as WTO/GATS. As far as engineering services are concerned, ECI's concern centres around movement of engineers abroad, and market for engineering consultancy organisations. As nations become competitive, they realize the value of quality in professional services. We, as a nation, must face the challenge of globalization of the engineering profession on the strength of its quality.

I have pleasure in placing the progress that ECI has made in this short period of one year since its creation. With the help of committees in which experts from our member associations and others, discussed a range of issues relating to the design of registration system, reports have been prepared on registration of professional engineers, registration of consulting organisations, continuing professional development of engineers, and ethics of professional engineers and consulting organizations. Once the reports are approved by the Board of Governors, ECI shall commence registration work through its member associations. Thus, ECI is fully geared to start registration work immediately and we hope to announce the first list of Professional Engineers in a matter of a few days.

We had also taken up the task of drafting an Engineers Bill. A separate committee was constituted for this purpose. The committee has prepared the draft after ascertaining the views of member associations and other experts. After seeking the approval of the Board, ECI shall submit the draft Bill to the government.

For facilitating the export of Indian engineering expertise under the WTO regime, ECI has sought the membership of the Engineers Mobility Forum. A detailed application document of about two hundred pages was submitted for this purpose. I am delighted to report that our application has been found in order and the same shall be considered for provisional membership at the next meeting of the Forum slated for June this year.

I should think that the amount of work done by ECI in just one year since its birth, notwithstanding the limitation of resources, is no small achievement.

We have designed this Conference as an integral part of the work being done at ECI. Through this forum, we shall place before the delegates the issues relating to registration work.

ECI does not derive grants from the government. ECI has been depending on the support of its members, some of them were generous enough to extend assistance in cash or kind, over and above the membership subscription. ECI has been able to secure external funding from DFID for a one-year project. For this Conference, ECI has been able to mobilise funds through sponsorship and delegate fees. We hope the deliberations of the Conference will vindicate the confidence reposed by the sponsors and nominating organizations in ECI and they will find the outcome useful for protecting and furthering the interests of engineers.

Before requesting Shri Pantji to inaugurate the Conference, may I invite Dr. Mashelkar to deliver the Keynote Address.

1.3 Keynote Address: Dr. R.A. Mashelkar

I would like to begin by congratulating ECI for doing so much in so little time of one year. Prof Ashoka Chandra talked about the fact that ECI has been able to bring together 24 professional associations including Institute of Engineers.

Today, if we are able to fathom the bottom of the sea and exploring mysteries in space, it is all because of the engineers. They have tremendous constructive power and tremendous destructive powers. Look at the events in IRAQ, which was destroyed swiftly by the engineers, and again its going to be reconstructed by the engineers. Look at the technological competitiveness index that people have developed over a period of time and there is the World Science Forum, which has created this index, and has ranked 46 nations based on the number of scientists, research and development, engineers and other talents. We are very proud to see India at the 1st position in terms of engineering profession, in terms of scientists we are placed 7th, in terms of intellectual property, we rank 39th and we are trying to improve over a period of time.

We are talking about professionalisation of engineers. Let us focus on the production process of our engineers, which starts from our educational institutions, college of engineering, IIT's and so on. If you look at the IIT, we are very proud of it. For 2000 people who enter into the IIT, there are about 20000 other good engineers who pass out. Today, 17 of the other institutions have been raised to the level of National Institute of Technology. In India with one sixth of the humanity, we require 60 IIT's. Central issue is that there are lot of very good engineering institutions. I personally believe that we will have to innovate to produce the kind of quality of engineers that we are talking about. Worldwide, academia do distance learning, and a whole range of issues about how to make distance learning more useful, for example, use of the ideas of tutors and mentors associated with the distance learning programme so that distance learning could be humanised and could reach out. I do believe that the process of continuous regeneration of knowledge at a good rate has to continue.

Dr. R.A. Mashelkar, Director General, Council of Scientific and Industrial Research (CSIR), is an outstanding chemical engineering scientist. He has over 235 basic research publications to his credit. His academic distinctions include the Fellowship of Royal Society (FRS) of UK, Indian National Science Academy, Indian Academy of Sciences, National Academy of Engineering. Dr. Mashelkar has won numerous national and international honours and awards. The President of India honoured Dr. Mashelkar with Padmashri (1991) and with Padmabhushan (2000) in recognition of his contribution to nation building.

Therefore we require for a country like India, new innovations. India cannot just depend upon the small number of elite institutions. India is a large country and therefore any model that we create should touch the large number and make large impact for that new innovation of unusual kind. I must also say that I would like the professional engineers to take up new challenges. Coming up with mere degree will not be adequate to cope up with the expansion of knowledge, especially scientific knowledge, which doubles itself every 10 years.

I was struck by what ECI says is its first objective. It is to promote science and practice of engineering for national development collectively along with the community; and that is where the big challenge is going to come from.

In what I have said so far, I have tried to give a base on the production of engineers that we have and with the emerging challenge that we are going to have to create not only professional engineers, but create contemporary engineers for the world market. We believe that we have a serious problem due to unregulated expansion in the number and types of institutes that has led to mushrooming of engineering certification system and has disarrayed the quality of each system. To my mind this is one of the biggest challenge. We have a problem because of the absence of a reliable yardstick.

In the degree and other certificates, we have lack of clearly laid down code of ethics for the professional engineers, lack of transparent statutory mechanism to monitor and enforce these and of course lack of accountability for professional engineers. Due to absence of harmonised norms and systems for professional engineers and the level of motivation for professional education, there is low level of acceptability in the market place.

I believe that these are going to be major challenges, which ECI is going to face. Therefore, I am very happy that these issues have been taken up by the ECI. I would like to end in the same way, as I do everywhere by saying "One talks about India's tomorrow, IT is India's tomorrow also India's tomorrow would be Indian talent. This Indian talent would be absolutely supreme and that includes development of professional engineers. We have tremendous opportunities. India is young nation and will continue to be a young nation for the next 15-20 years. Advancement of USA, Europe, and Japan are getting older and their segment of population reaching the age of 60-65 is 30%-35%. Enormous burden of social security is going to be a major challenge.

I am particularly happy that ECI has drafted an Engineers Bill and one does believe if this Bill is accepted by the Government and passed by the Parliament, it could replace the regulatory system into a statutory mode for effective professionalisation of engineers and this will be a major contribution indeed.

I would like to end by thanking you all for giving me this opportunity to speak as an engineer, as a fellow engineer, and I wish you all the best in your endeavour in the journey on engineering the design of the great nation.

1.4 Inaugural Address: Mr. K.C. Pant

Shri K.C. Pant, Deputy Chairman, Planning Commission, Government of India, is the Patron of the Engineering Council of India. He has been a distinguished figure in our public life for the last 30 years. These include Minister of Finance, Steel & Heavy Engineering, Home Affairs, Irrigation and Power, Energy, Education and Defence. He is Chairman, Tenth Finance Commission, Advisory Board of Energy, and Task Force on National Security. Shri Pant is a rare politician who has a Postgraduate Degree in Chemical Engineering from West Germany.

I am really delighted to be amongst you this morning at the First National Conference on Professionalisation of Engineers organised by ECI and I feel greatly encouraged by the attendance. Some of the faces, which I see before me, are of persons who have put efforts in the development of the country and who have done engineering profession proud. It is credit to this organisation that it has mustered this kind of support from the engineering community in India.

As explained earlier the genesis of this council lay in the realisation of the need for an organisation for engineering across the spectrum covering various disciplines and absence of such an organisation ultimately would deprive the engineers of various kinds of opportunities, which have been spelt out to you earlier. If there are other engineering associations, which are not included, I hope they too will join ECI soon.

One of the question which has been raised just now and which really has been in the minds of many people among the engineers is the whole question of whether their role in the society is adequately appreciated, after all their role is crucial. There are dreamers and other people but those ideas have to be given shape. They have to be converted into useable projects and products and that is the role of the engineering that they can play. Engineers are absolute fighters and their role is that of the creator. This, I think, society has to be grateful for, but society in India looks at what they see at their level and they form their own judgement.

Question of quality and accountability was mentioned by Prof. Ashoka Chandra with reference to the Engineers Bill and I think this is an important aspect and that is why Engineers Bill has been under discussion for a long time and it has now taken shape as of great importance. The other aspect which has been raised is in relation with the emerging international situation and how the engineering profession is to face up to the situation where the WTO regime also comes in. This change has been brought about by globalisation suddenly. You find some people, who have achieved certain degree of professional competence, and they have become international citizens. IIT and IIM students too go abroad. I am not going to question as to how many of them should stay back. I also feel that their going abroad is also an asset to the country.

I hope they come back after picking technological and efficient ways. Today, some one specialising in certain field and reaching certain level of competence is in demand. This change has come about in the last few years. This is going to increase as globalisation proceeds further as world becomes smaller and communication increases and possibility of outsourcing is increasing, which may also partly enable the people to work at home for any company any where.

I don’t think we should hesitate to increase the number of engineers we produce. What we have to be careful about, is the quality and that is the essential point. Once quality is there, then apart from immediate requirement of finding work in other countries, we should also take advantage of the changes. Earlier, manpower was developed focussing on internal

requirements. It is changing and is quite possible, if you take forward looking view to see, that we take full advantage of a fact that we have a young population.

Now if you look at new opportunities that may arise in the fields of IT, Bio-technology, new areas of science and technology as well as perhaps tourism, then you can train people not only in respect of your own needs within the country, but keeping in mind the fact that we can perhaps give these services at a much cost effective rate than the developed countries. Tomorrow it may be possible that the developed countries prefer to outsource a lot of work and we get work and employment easily in this country taking advantage of globalisation. Even today our engineers have built up a good reputation within the country and we have many outstanding engineers.

We have a strong base of education in engineering. It has a very strong apex but the bottom of the pyramid is not strong. Because of difference of standards among various institutions in our country one has to be very careful. The gap between the best and the worst has to be narrowed to give a strong foundation/ base.

In research you have to devote far more attention especially industrial and scientific research. With good research, we can go ahead. Today it is necessary to build a strong base of research, which will sustain the development.

It is important to build into our systems, a continuous updating of knowledge, which in all fields is increasing enormously every hour. There are also open universities, which can be used better for professional courses and for updating the knowledge of those who are working out in villages, small towns etc. The other advances are being made in the material sector in terms of cost or in terms of speed of construction. You will find that you can save money by accelerating speed of construction by 20% to 30% even though the material is costlier. The continued development is a continuous process through which you update the knowledge. This is an important aspect and I hope this Council will devote some attention for the continuous professional development of engineers spread out all over the country. I am looking forward to the very laudatory and praiseworthy initiatives, which the Council is taking. I have gone through the items of their agenda, which covers, important areas, and also people with a lot of experience, who are going to speak on the varied subjects. They have been achievers and I attach a great deal of weight to this fact. I look forward to receiving your recommendations. All of you have to strengthen this organisation and to see today that engineers are not merely good professionals but good leaders of society and that is the real role of engineers who create standards for others.

1.5 Vote of Thanks: Prof. G.P. Lal

We are extremely grateful to Hon'ble K.C. Pantji for sparing valuable time and coming here and giving a vision and direction regarding the importance of engineering profession. ECI was formed so that various multiple engineering institutions and associations join hands and sit

down on one platform to consider it in organised and greater manner. You have rightly said about the emerging international scenario and global competition that demands high level of engineering knowledge at affordable costs to all its stakeholders. ECI is committed for continuous professional development and to provide our members opportunities to develop continuously. Professional Engineers Bill you have mentioned has been drafted and deliberated. It has been circulated to the member institutions and it is almost in the final stage and hopefully this will go to the Government for enactment and once again we look forward to you to see that the enactment is done quickly.

ECI is committed and shall continue to be committed for the continuous development of the engineering society and standards, which meet the international level so that our entry into EMF may not be difficult afterwards and our engineers may continue to work with great profound respect. I thank you for your presence and assure you that the direction that you have given to us will be discussed seriously in the next two days and we shall come up with a definite proposal.

Prof. G. P. Lal is the Vice-Chairman of Engineering Council of India. He was the President of the Institution of Engineers (India) for two consecutive terms (1992-94). He is the President of the Council of the World Federation of Engineering Organisation (WFEO). He publishes a quarterly newsletter in English, French and Spanish on issues relating to sustainable Development for WFEO.

It is gratifying that we have with us eminent engineer Dr. R.A. Mashelkar, who has given a new dimension to the scientific and industrial research in the country. Sir, you have spoken about the engineering education that is required to continue updating the knowledge as it is expanding at a very fast rate and we acknowledge seriously the need to produce contemporary engineers in today's situation. We are thankful to you, Sir, for telling us how word 'engineer' came and how engineers are producing everything, constructive or destructive. Well, Sir, tools of destruction might have been produced by the engineers but those tools are not being used by the engineers but by the leaders. I also agree with you and Pantji when you say that engineers have to be leaders so that such type of things do not happens. We have heard you very seriously, Sir. Your view will help us to structure discussions now going to come during both the days and we sincerely thank you for your presence here and all the guidance you have given us.

We have a galaxy of professions here presenting keynote address, participating in discussions that will make these two days of the conference very important. We are all from the member institutions of ECI and have contributed in one way or another for the successful conduct of this conference.

We are thankful to the principal sponsor Oil and Natural Gas Corporation, our sponsors Larsen & Toubro, NTPC, BHEL, Indian Oil Limited and our co-sponsors RITES Limited, IFFCO, Unitech

Limited, Engineers India Limited, Power Finance Limited and all others who have contributed for this conference.

You know that this conference has been organised in a very short period of time and has been organised successfully quality-wise and quantity-wise. I would also like to compliment Dr. Uddesh Kohli, for planning and putting in tremendous efforts made by him and his team under the leadership of Prof. Ashoka Chandra, Chairman ECI.

I appreciate the work of ECI, not only that the conference has been made in a short period of time but it has also moved in a very planned manner and in a fast manner to accomplish many of these documents, which will be placed before you during the two-day conference. You will find lot of work has been done. We shall also need the cooperation of the member institutions and the engineering community of the country, patronising and blessings of the government and other senior officers.

I thank all the delegates and the participants in the conference and lets us hope that the conference is going to be memorable one and meaningful one.

2. TECHNICAL SESSION I: ISSUES FACING THE ENGINEERING PROFESSION

Session Chairman Mr. H.L. Bajaj,

2.1 Problems faced by Engineers: Prof. V. S. Raju

2.1.1 Some of the problems from the perspective of an Academic are:

- The Initial Educational process short comings
- Fast changing requirements of Engineers
- Inadequate emphasis on Continuous Professional development
- More focus on Procedural audit, very little on performance audit
- Insufficient / Inadequate synergy between, owners, Architects/ Designers/ Builders
- Our National standards not keeping pace with new developments
- Very poorly trained workmen, technicians and supervisors
- Insufficient focus on Attitudes, Values, Leadership and Self-Improvement

2.1.2 The Initial Educational process short comings are:

- Faculties in most institutes have very little practical exposure because of very limited interaction between Institute and Industry.
- Even to ensure the quality of institutions in existence is very difficult.
- The rate of expansion is too high. There are 200 Engineering colleges!
- Availability of financial and faculty resource is very very acute.
- Faculty positions unattractive – large salary differentials with industry.
- Equally crucial – not many opting for doctoral programs.
- Very best graduates go to industry, management. Few wanting to pursue graduate programs prefer the developed countries, in particular United States.
- Number returning to the country for faculty positions is decreasing.
- Establishment of R&D centres by multinationals in India – most welcome but, impacting on faculty availability.

Mr. H.L. Bajaj is the Chairman Central Electricity Authority and was Ex-officio Secretary, Government of India. He has had a distinguished career, he was a Director in the Board of Governors of NTPC and earlier in BHEL also, prior to that his leadership in Haryana State Electricity Board culminated in 100% electrification being achieved in Haryana.

Prof. V. S. Raju, former Director, IIT Delhi, is the recipient of the “Commander Cross” award of the federal republic of Germany, which is the highest award given to a foreigner. His field of specialisation is academic administration, teaching, Research and Consultancy in areas of Geo-technical Engineering and Ocean Engineering. He is extensively involved in academic research, sponsored research and consultancy. In published material, he has over 80 scientific papers and

100 technical reports to his credit. He is Foundation Consultant for over 100 projects spread over India and Abroad.

2.1.3 Fast changing requirements of Engineers are:

Traditional Attributes	XXI Century Additional Attributes
Problem – solving abilities	Learnability: learning to learn
Analytical Skills	Strong desire for life-long learning
Ability to relate to practical aspects	Ability to work in a team
Inter-personal skills	Exposure to commercial disciplines
Management skills	Creativity and Innovation
Decision-making skills	Integrative Skills
	International outlook
	Ability to deploy IT
	Ability to work at interfaces between traditional disciplines
	Commitment to sustainable development

2.1.4 Recent Issues include:

- Most fresh graduates want to become IT Professional.
- Quality Engineering graduates in Electrical, Mechanical, Chemical, Civil etc. not available for infrastructure projects (Transportation, Power, Water, and Sanitation), manufacturing facilities etc.
- Poor quality of large number of graduates – Unemployment – Serious financial implications to the families.

2.1.5 There is inadequate emphasis on Continuous Professional development:

- Barring few major industries, HRD function is considered as only hiring people and looking at their promotions rather than their continuous improvement.
- Fortunately there is recent awareness on this.
- Some special programmes and synergy between academic institutions and industry. Ex: M.Tech programme in Power Generation Technology and Management at IIT Delhi sponsored by NTPC for their Engineers; M.Tech programme on Construction Technology and management at IIT Delhi, and IIT Madras sponsored by L&T, ECC Construction Group.

2.1.6 We have more focus on procedural audit, but very little on performance audit. There is insufficient / inadequate synergy between owners and Architects /Designers / Builders.

2.1.7 Our National standards are not keeping pace with new developments. We have very poorly trained workmen, technicians and supervisors. There is insufficient focus on attitudes, values, leadership and self improvement.

2.1.8 Concluding Remarks

- As engineering community, we have done well in India. However our potential is much higher.
- While we have shown that some of our activities are on par with the best in the World, this excellence has to be spread, to every aspect of engineering activity on a much broader front.
- What then is required to achieve excellence? It is for each one of us to ponder and it is not difficult to find the answers.

2.1.9 Based on my experience, I recommend the following:

- A commitment to excellence from each one of us, engineers present and not present here.
- A positive attitude to continuously learn and to accept change for the better.
- Partnership and team work among all concerned: owners, consultants and contractors.
- Code of ethics for everyone to follow such as,

i. To act on the basis of a well informed conscience.
ii. To act in the interest of the community and for common good.
iii. To be scrupulously honest in the discharge of our duties as engineers.
iv. To utilise our knowledge of engineering, in the service of our mother land and humanity.
v. Finally to remember our fundamental duties as enshrined in our Constitution, Article 51A Part IVa:

To strive towards excellence in all spheres of individual and collective activity, so that the Nation constantly rises to higher level of endeavour and achievement.

2.2 Professionlisation of Engineers: Mr. P.P. Dharwadker

2.2.1 On the occasion of the 1st National Conference on professionalisation of engineers, I must compliment the various professional organizations and Institutions of Engineers who have decided to come together and work for advancement of the engineering profession as a whole and enhance its image.

2.2.2 Formation of the Engineering Council of India was badly needed in the context of globalisation and liberalisation taking place all over, to enable the individual professional and organisations of the professionals to belong to the global village to improve the quality of performance of professional engineers and make them accountable for their work as responsible citizens.

Such representative organisation is better equipped in getting the recognition of the expertise of the Indian professional engineers and thus contribute to their mobility at international level in the newly emerging WTO/ GATS regime. It should also help the professional engineers for employment in internationally funded projects in the country and abroad and enhance our prospects of increased projects and consultancy exports. This forum – the 1st National Conference of ECI, has rightly taken up the discussion on the various issues connected with the present situation of professional development and recognition so as to crystallise certain matters which are somewhat hazy and decide on the exact role of ECI in the development of the profession on the right lines to the expectations of the professionals representing them

2.2.3 During the last one year Engineering Council of India has appointed a committee of experts on:

- Development of professional engineers
- Registration of professional engineers
- Ethics for professional engineers and consulting engineers and
- Forming of a new draft for Engineers Bill

The Engineers Bill under finalisation by the Council is going to fulfil the long felt need of the profession to regulate the practice of both the professional engineers and consulting organisations and in the process, safeguard life, health and property of the people and promote their welfare. It is expected to fulfil the need of the statutory regulations to protect the interest of the profession as also that of the clients/government and the public at large, with prescribed standards of professional conduct etiquette and Code of ethics, capable of discharging other responsibilities effectively and be accountable for the end results. Development of professionals will help in increasing our prospects in GATS related projects, improve our linkages with International funding organisation, contracting and consultancy organisations as also with foreign agencies operating locally.

2.2.4 I would now like to deal with some of the important and relevant requirements for the Profession to succeed in the International arena

- Our professionals must put in more efforts on managing multi-disciplinary teams with Joint Venture to make a real dent internationally.
- Professional engineers must get involved in a larger measure with responsibility, integrity and accountability at the policy making level.
- Professional engineers must seek important roles in public and political debates accompanying new investments.
- Our professionals must learn all the particulars of managing information flow with the latest in the IT and de-centralisation of the decision making process.
- Our professional engineers must understand the implications of professional liability and take proper precautions including insurance requirements.

- Expert efforts must be put in by our professionals on capacity building of their organisation with proper stress on integrity management.
- Our professional institutions must concentrate on human resource development with ethical principals and good business practices – here the Council can play its role effectively.

As true professional you should aim at applying the engineering knowledge and expertise with high level of competence through continuing education and expertise.

Let us be proud of our profession and the exemplary achievements in the Country's development process and contributions abroad by our predecessors. I consider engineering as one of the noblest professions for anybody to serve. Let us put more effort to take our profession to yet greater heights and further improve the dignity of this profession and sky is the limit for our young professionals.

Questions & Answers

Question-1.
Dr. R.A. Mashelkar said that the 'construction' and 'destruction' tools are being made by the engineers and are used by the leaders. Recently, a committee under the Chairmanship of Mr. Pranab Mukherjee gave recommendation that engineers should not be allowed for professional services like IAS, IPS and other elite services. If that is the situation, how engineers will become leaders and what will happen if they put a ban on engineers in administrative services?

Answer-1.
Mr. P.P. Dharwadker. There is a controversy that Professional like Doctors, Chartered Accountants, Engineers and other professionals, should not enter the arena of IAS, IPS and other elite services. I would like to say that you have the fundamental rights to do what ever you want to. No one prevents you from entering any profession. You have much better scope in your profession than what file shifters and paper shifters do.

Prof. Raju. We have fundamental rights and you can join any profession you like but finally we should respect our profession and it is for the individual to choose. We have to create excitement in our own disciplines and show opportunities to the people, then they will automatically respect our profession. You have to create an excitement for service in your own profession.

Mr. H.L. Bajaj. I don't see that there is any possibility of such a ban. I have been dealing with many IAS officers currently employed and retired, and I find that they are very analytical and they know the engineering issues/problems very well and their decision making is based more on facts and figures than intuition. I would say that they are also able to respect other professionals much more, so don't have any idea that this would happen.

Question-2.

There is a question on the status of engineers in our society and also the steps to be taken both internally and externally to increase the respect of engineers in the society. Firstly, in our scheme of things Ministries of the Government play a very nodal role in the development of the country. Can you imagine the state of affairs in the Department of Science and Technology or Atomic Energy, if career bureaucrats run them? Secondly, engineers who were already employed in those departments tend to be treated as second class citizens. We must equip the engineers and develop so much competence in all areas of operation, technical, managerial, management of external environment so that on the basis of that competence they can hold that job and command respect. Thirdly, the professional institutions can create consciousness in the society so that the departments in which the bureaucrats do not specialise must go to the technocrats. I would like to have your comments on these?

Answer-2.

Prof. Raju: Great Mahatma Gandhi said "Nobody can take your self respect until you are willing to give it away". Today, Pantji said in the morning that we are visible, we are with the people, if we are not producing upto the standards, not upto the international benchmark, not upto the expectations of the people, then what kind of respect will anyone earn. All this depends upon the values, attitudes and the value systems. On question of respect, why not we treat all well, all equal; why to make difference between an engineer and an IAS officer or any one under any community.

Comments by a Participant on the remarks about "the file shifters and paper shifters". Reacting adversely, a participant said that he had done engineering 30 years before and had been in the secretariat for the past many decades. A paper shifter and file shifter knows, what time the paper has to be shifted, which file to open and at what time which file to close, what time, and which paper to send and where. I know I have to go through a mental transformation, I have to go through a chain of levels, I have to take hold of these files and papers before going through a mental transformation. The only legitimate duty in the Govt is direction, monitoring and controlling. These are the three duties of an elected important government. These three duties require only shifting of files and papers which is out and out administration. We talk of the interfaces of various branches of engineering through which we will be able to slide and glide in the changing scenario. If this interdisciplinary face has to be handled confidently, let us remember that there is a greater challenge between engineering and administration, between engineering and finance, and between engineering and law. These interfaces also are osmosis, which have to take place. We should be able to transcend through osmosis. If our mindset is limited within the engineering discipline, all these other disciplines will elude us. So we must be willing, and capable to take on this transformation also.

Question-3.

Emphasis had been made on the requirement of the interaction between teachers and industries. We have approached various industries during the vacation for attachment of our teachers with them for a week's time, but the response received had been very poor even from the big industries. I would like to use this forum of industrialists present here to request them to allow the academicians to visit their industries and allow them to get trained. At the same time I would request ECI also to make recommendations to the industries to encourage such things which will definitely help teachers and industries both.

Answer 3.

Mr H L Bajaj. In this kind of requirements, what becomes very important is networking. In these circumstances, we can also see and contact any of your old students of your institution to make such kind of arrangements.

Participant. The interaction between the industries and institutes is poor. I should also state that the reasons should also be looked into. I have been from the industry and have interacted and taken part in the academia for the past 10-12 years. There is a dearth of people from the industry who are willing to come and contribute.

The other problem is from the industry. If some one from industry wants a PG diploma or a Ph. D degree, it is difficult to get it from an Indian University than a foreign university.

Participant. There is urgent requirement to update outdated standards. In the developmental expenditure, it was mentioned that Rs. 25,000 crores had been spent and Rs.30,000 crores has been earmarked for projects. Far less has been earmarked for improving the standards. It has led to a decline of standards.

Question-4.

The question that bothered me is, what are we doing for the Country or Community, which is spending lot of money on us for our education. I think we should atleast contribute the first two years after our graduation to our country or community, which is spending a lot on us?

Answer 4.

Prof. Raju: This is again an individual's perception, I don't think we can compel any one and we should not also. The starting point is that we should see ourselves become a role model and make others follow it.

3. TECHNICAL SESSION II: EMERGING INTERNATIONAL SCENE

3.1 Services Negotiations at the WTO: Implications for the Indian

Session Chairman: Mr. V.K. Agarwal

Engineering Profession: Mr. R. Gopalan

3.1.1 Services - Statistics

- World trade in commercial services in 2001 amounted to $1.440 trillion (Roughly 1/4th of goods trade). Average annual growth rate of 6.2% over 1990-1999
- Exports from India in 2001 - $20.4 billion, registering annual percentage increase of 15%. Steep rise from the $6.5 billion of exports in 1995
- Share of India's exports in world trade of services - 1.4%
- Imports by India in 2001 - $23.7 billion
- Services share in Indian GDP was 48.8% in 2001

India's core advantages in services are:

- Availability of trained English speaking workers
- Low cost of service
- Established infrastructure and competence in IT and IT Enabled services
- This means that India is well placed to take advantage of the emerging situation of manpower shortage in the developed world.

3.1.2 General Agreement on Trade-in- Services (GATS)

Trade in Services is different from Trade in Goods: Cross Border Supply in Goods vs. our modes of supply in Services namely Cross Border Supply, Consumption Abroad, Commercial Presence, Movement of Natural Persons.

Control through Regulations – No Tariffs

Obligations – General (MFN, Transparency) vs. Conditional (National treatment)

3.1.3 Negotiating Calendar

As per Doha Ministerial Declaration read with the Guidelines and Procedures for negotiations (NGP), the following calendar is mandated:

- Initial Request – 30th June, 2002
- Initial Offers - 31st March, 2003

- Government Procurement/ Subsidies/ Domestic Regulations : aim to complete negotiations prior to completion of Negotiations on Specific Commitments, i.e. January 1, 2005

Mr. V.K. Agarwal is the former was the Chairman of the Railway Board. Presently he the Managing Director of the Indian Railway Welfare Organisation, he is also the in the Board of Governors of the Steel Authority of India Limited and other organisations. Besides being the fellow of National Academy of Engineers he is also in the Institution of Engineers (India).

Mr. R. Gopalan, IAS, is Joint Secretary to the Government of India, Ministry of Commerce & Industry, Department of Commerce since 14th Dec. 2000. The various positions held by him include Chairman & Managing Director, Tamil Nadu Industrial Development Corporation Ltd., and Tamil Nadu Newsprint & Papers Ltd and Special Secretary, Finance Department, Government of Tamil Nadu.

3.1.4 Nature of GATS

- Members required to undertake binding commitments which add to certainty and predictability of trading regime; members exercise choice in making commitments. Flexibility for developing countries to open fewer sectors and liberalize fewer types of transactions.
- Positive list approach involving choice of :
    - Service sectors in undertaking commitments
    - Modes of Supply in undertaking commitments
    - Horizontal Commitment or sectoral commitments
- Negative Listing of Limitations on :
    - Market Access (limits on number of suppliers, total value of service transaction, total number of service operations, and total number of natural persons to be employed by a service supplier, the percentage of foreign equity and the type of legal presence)
    - National Treatment (covers any discrimination to be made against a Foreign Service supplier).
- Due respect for national policy objectives and levels of development
- Facilitate increasing participation of developing country Members in world trade (access to technology and distribution channels, liberalization of sectors and modes of export interest)

3.1.5 Guidelines and Procedure for Negotiations

- Progressive Liberalisation of Trade in Services
- Right to regulate & re-regulate supply of services

- Maintain structure and principles of GATS including right to choose sectors and modes.
- No a-priori exclusion of any Sector or Mode of supply– Special attention to sectors and modes of interest to developing countries
- Request - offer, the main method of negotiations.
- Starting point of negotiations : current schedules of commitments
- Flexibility in making Commitments for developing countries.
- Credit for Autonomous Liberalisation.
- Assessment of Trade in Services and adjustment of negotiations accordingly.

3.1.6 India's Interests

- Mode 4, particularly for independent professionals as well as skilled technicians.
- Mode 1, where core competence in IT offers scope for capitalising on access through Consultancy services.
- In exchange, may have to offer commitments in Mode 3, the priority of our trading partners. Given the extent of market access autonomously available to Foreign Service suppliers, this may not be too difficult. Nevertheless, interests of domestic industry and labour need to be safeguarded.

3.1.7 India's interests - Mode 4

- We have sought horizontal commitments as follows:
  - Access for Independent Professionals and for employees of firms with or without establishment in host country on basis of contract
  - With client in host country – delinked from Mode 3
  - In return, may have to give greater access for ICTs, the primary concern of several trading partners
  - "GATS Visa" concept may be useful in this regard: this may cover fast track processing of applications from professionals in identified categories, lesser documentation and evidence requirements, transparency in processing, removal of ENTs in these professions, enabling mobility between clients in host country, exemption from normal social security and other contributions.

3.1.8 Construction & Engineering Sector

W/120 (WTO Classification of Services sector) lists Engineering services and Integrated Engineering services under Professional services. In addition, there is a separate category on Construction & related Engineering services.

- Most countries deal with the two sectors together.
- For India, this is a sector of considerable export interests, particularly in the following :

- Mode1 – only for consultancy services
- Mode 4 – for professionals, both as ICTs and independent professionals. Highly qualified middle level & skilled personnel such as Civil Engineers, Electrical Engineers, Electronics and Telecommunication Engineers, Mechanical Engineers, Chemical engineers, Mining engineers, Metallurgists and related Professionals, Cartographers and Surveyors etc are covered.

3.1.9 Requests made to India in Construction & Engineering sector

- Take full market access and national treatment commitments on Modes 1, 2 & 3 and horizontal commitments on Mode 4.
- Remove the existing limitations on foreign equity.
- Either remove the requirement of joint venture or enhance transparency of regulations so as to simplify the process of establishing joint ventures
- Provide details of the discriminatory tax measures between Indian and foreign suppliers. Apply tax laws with objectivity, transparency and consistency.
- Unify and standardise sub-federal measures as far as possible.
- Remove restrictions on, or procedures for, overseas remittances
- Establish clear criteria & expeditious procedures for Intra Corporate Transferees (ICTs).

3.1.10 Requests made by India in Construction & Engineering sector

- Take full market access and national treatment commitments in respect of Engineering professionals including Civil Engineers, Electrical Engineers, Electronics and Telecommunication Engineers, Mechanical Engineers, Chemical engineers, Mining engineers, Metallurgist and related Professionals, Cartographers and Surveyors etc.
- Recognize the qualifications of Indian Engineering professionals
- Remove the requirement that engineering service may be supplied only through joint venture or representative office or regional office.
- Remove the nationality requirement for licensing

3.1.11 Formulation of OFFERS

- Assessment of the REQUESTS underway.
- Evaluation of trade and developmental interests

  - Consistency with national policy objectives;
  - Promotion of FDI;
  - Improvements in business and/or social infrastructures;
  - Promotion of technology transfer;
  - Reduction/elimination of domestic supply gaps;
  - Existence of appropriate regulatory framework.
  - Other social/economic/regional policy objectives;

3.1.12 Approach

- India has already undertaken considerable AL in most sectors. This has not been reflected in our Schedule of Commitments.
- As such, Foreign Service providers enjoying access to the Indian market under Mode 3, without India gaining concomitant access in Mode 4 in particular.
- While our FDI policy makes it easy to offer commitments in Mode 3, we have much to gain by way of commitments in Mode 4 since the current bindings of our trading partners far below our aim.
- Strategy: play off commitments in Mode 3 to gain commitments in Mode 4.

3.1.13 Domestic Regulation

Along with the negotiations on specific commitments through the requests-offer process, negotiations on General obligations pertaining to Domestic Regulation are underway in the Working Party on Domestic Regulation. The negotiations are within the following framework:

- Conditional Obligation (in committed sectors):
- Administration of measures of general application in a reasonable, objective and impartial manner (Art. VI: 1).
- Negotiating Mandate (Art. VI:4): Further disciplines to ensure that licensing and qualification requirements and procedures and technical standards, are:

  - based on objective and transparent criteria;
  - not more burdensome than necessary to ensure quality;
  - not in themselves a restriction on the supply of a service (licensing procedures).

India is interested in these negotiations because:

- Issues relating to licensing, qualifications and technical standards are important for facilitating supply of services, particularly professional services through Mode 4.
- In the absence of recognition of Indian qualifications, difficulty in supply of professional services is anticipated.
- Achievement of recognition of qualifications through bilateral MRAs proving to be slow; therefore, attempt to expedite through multilateral work.
- Critical problems of arbitrariness and lack of transparency in the administrative and visa/ work permit procedures being faced by Indian service exporters.

3.1.14 Mutual Recognition Arrangements

- Article VII of GATS - Recognition of education and experience or licenses/certification obtained in another country may be based on agreement or arrangement with the

concerned country or accorded autonomously. Article VI.6 obliges members to provide adequate procedures to verify competence of professionals of other countries.

- Article VII.2 - Members obliged to give adequate opportunity for other interested countries to negotiate accession to an existing agreement or to negotiate a comparable one. Article VII.3 prevents members from according recognition in a manner that would be a means of discrimination. Under Article VII.4, members obliged to notify to CTS agreements entered into or of opening of negotiations for an agreement.
- Article VII.5 - Recognition should be based on multilaterally agreed criteria; efforts to establish and adopt common international standards and criteria for recognition and for practice should be made.
- Notification obligation not satisfactorily observed; so far, 38 bilateral MRAs notified mainly in education, professional services and insurance.
- Indian attempts to negotiate bilateral MRAs proving to be slow. Developing countries like Thailand, Philippines, China, Indonesia, Argentina etc. support need for MRAs as means of gaining access under Mode 4.

3.1.15 Domestic Regulation

Issues under consideration:

- Necessity Test (obligation not to create “unnecessary barriers to trade”)
- Transparency (requirements in addition to general transparency provisions)
- Equivalence (consideration of education, professional experience etc. obtained abroad)
- International Standards (role as a benchmark?)

3.2 Emerging International Scene: Prof. S. S. Chakraborty

3.2.1 It is absolutely essential that we get more and more assimilated into the global market with focus on our own interests. We should reach the status of “Developing Country” and leverage it while bargaining.

- We have to look at ourselves as a developed nation Dr. A.P.J. Abdul Kalam, President of India
- Rapid development of India is in the interest of the world Bill Clinton, former USA President

3.2.2 GATS & Engineering Services

- GATS enables trade in engineering services
- Trade accelerates knowledge exchange and continual development
- Society benefits through technology, or engineering science – Prof. Thomas Kuhn

Mr. S.S. Chakraborty, the Managing Director of Consulting Engineering Services (India) Private Limited, New Delhi has been in the command of a large techno-managerial workforce of professionals for nearly three decades. He is Vice-President of International Association of Bridge and Structural Engineering (IABSE), Zurich, and Member to the General Assembly of FIB, Geneva. He is recipient of the Silver Plaque from the federation of Indian Export Organisations (FIEO), in recognition of his organisational capabilities. He was conferred Shelter Award for outstanding achievement by the Shelter Promotion Council of India.

3.2.3 Probe into Indian Situation

- Are we making relevant connections between education & practice?
- How are we furthering the value of our engineering education?
  - Standards for curriculum & continual upgrading
  - Practical orientation
  - Industry – academia interaction
- How are we marketing our expertise?
- How fast and how relevantly are we responding to global changes?
- Is anyone presenting the capabilities of Indian engineers in a comprehensive and co-ordinated manner?

3.2.4 Professionalisation of Engineers

- Integrity - Commitment to future
  - Reaching beyond the horizon
  - Mentoring young engineers
  - Subscribing to sustainable development paradigms
- History - Respect for the past
  - Pointer to continuing education
  - Pointer to cross-fertilization

3.2.5 Professionalisation of Engineers

- Co-ordination amongst the distinct but inter-dependent fields of engineering
  - Education
  - Professional practice
- Co-ordination on the above aspects are sine qua non for development of professionals as well as projecting Indian capabilities abroad.
  - Comprehensive quality control through stringent affiliation procedures

- Registration of practicing professionals to assess competence and continued development
- Licensing (may be taken together with registration) for accountability

3.3 Mr. Pradeep Chaturvedi:

Engineering profession for the new millennium – the Emerging International Scene

Author and engineer Henry Petroski has defined engineering as "the art of rearranging the forces and materials of nature for the good of society". Engineers throughout our nation are practicing this art, thereby directly contributing to the development of all goods, capital, expendable, or consumable needed or desired by society. They are also, of course, directly involved in the process of extracting, fabricating, delivering, and maintaining all of these goods. Engineers therefore, are an essential link between any local, national, and global economy. They add value by increasing the employment, enjoyment, nourishment, and fulfilment of all of the world's people. Interestingly though, this contribution is not understood or appreciated by the vast majority of these people – quite possibly because, for all of their contributions, engineers rarely take on political leadership roles in the broader community.

When the public does focus on engineers and their work, it is often due to the inadequacy or failure of a product or process. In the "overly legal" atmosphere of today's industrial society, like that of American society, failure of either usually results in an all-out effort to demonstrate liability on the part of anyone involved in the creation, production, or operation of the faulty item. Therefore, engineers are often cast as culprits and as mediocre parishioners in an unrewarding profession.

Moreover, even our schools often do not portray engineering as a worthwhile and rewarding profession. The primary tools of engineering – necessary to understand and rearrange the forces and materials of nature – namely, mathematics and the physical sciences, are viewed as difficult and even intimidating by many educators, especially those at the elementary school level. Since we are all influenced for life by the views and values we are exposed to before age 10, it is very likely that potentially successful future engineers are being negatively influenced toward the profession by even well meaning educators.

Whereas in USA, Canada and many other industrialized countries, the professional engineering societies are tackling this issue, not much has been done in India except for discussion showing concern at the changing scenario. Thanks to IITs some of the bright students still work very hard for an engineering career. However, the attraction towards humanities and commerce subjects amongst students has been observed due to good financial prospects at the entry level of employment, mainly due to advent of service sector.

Target State

A broad recognition of the engineering profession as a vital asset for the maintenance of our economic viability and quality of life in the global environment is important.

The year 2001 remains a landmark for the engineering fraternity. The professional engineers, community in India, converged on a single point agenda to set up the Engineering Council of India to finally regulate the engineering profession in the country, leading overall development of the engineering sector at the national level and larger contribution at the international level. The professional engineering societies (who agreed to converge on to this institution, while maintaining their independent identities) have taken a historic step.

The initial interest aroused by ECI is reflected in the fact that it attracted 24 societies that are registered in India or abroad; societies that have membership of over 400,000 and others with only in hundreds; societies with large infrastructure spread over all regions and geographic contours of the country; and societies that have only a representative office in one city; societies that have their office being run from the office of the office bearers and so on. The harmonious relationship, developed over last one year has been remarkable.

I have been designated the task of speaking on the Emerging International Scene and I wish to deal with the situation as it is taking place in some of the countries. As I have been told that I represent IEI, it is but natural for me to refer to the efforts of my parent organisation.

“The Institution of Engineers (India) is set up to promote the general advancement of engineering, and engineering science and their applications in India and to facilitate the exchange of information and ideas on those subjects”.

Pursuing the main objective the Institution has created awareness amongst professional engineers and developed them in sufficient numbers to meet the challenge. Whereas the formal route of technical education through institutions is a major step forward, the professional societies have significant role in promoting the non-formal education, especially when we consider the following three indicators:

- One, that the momentum generated by technological changes in the last decade would continue unabated with changes taking place at even faster rate;

- Two, the integration of the national economies into a global economy will get accelerated with further liberalisatioin and globalisation, removal of tariff barriers, mobility of the workforce, and

- Three, the expectations of the people in all parts of the world would grow demanding from their governments a higher quality of life, and a better environment to live in.

UN Millennium Development Report – Engineering the Sustainability

The UN Millennium Development Goals outlined by the Secretary General of the United Nations have thrown open major challenge to the engineering fraternity to fulfill all the needs of the society by introducing innovative approaches and setting forth new standards and norms for improving quality in product and services.

The Millennium Report gave due consideration to sustainable development, not only of the natural resources but also of the human being. The concept of globalisation has also taken a new turn when the Secretary General outlined that the globalisation should be not only poor inclusive but poor centred, and not poor excluded. In sum total the development has to result in better quality of life of the poor and has to provide more employment and earning opportunities. All the discussions at WTO and WSSD took notice of the same.

The Millennium Development Report has its Goals 7 & 8 as follows:

- Ensure environmental sustainability
- Develop a global partnership for development

These two development goals have a direct relationship to the contribution of the engineering fraternity to uplift the common man. The focus on sustainable development and also on the need for networking, interaction and mobility. The underlying concept of these two development goals focuses on the contribution of engineers and the engineering inputs.

Consumption & Production Patterns and Value System

Two major issues of concern in the global arena are 'consumption and production patterns' and the 'value system'. Both of these are now dictating the global development scene.

The reason why I chose to refer to these two important instruments is that the Engineering Council of India has very appropriately included in its aims to focus on both these issues. Having been involved with the UN development programme and also the setting up of ECI, it is easy for me to link these issues. ECI has brought under its umbrella the Institutions that cherished different value systems and have different codes of ethics, governed by the laws of the governments where their parent bodies have been registered. Once they come under the umbrella of ECI, they will all be governed by the common code of ethics, which will really instill the sprit of global movement.

Let me now refer to how the ECI is affecting the second aspect of consumption and production patterns. The thrust on the continuous professional development is an ideal instrument that will create not only awareness but also skills and capacities in its members to keep abreast with the globally, eco-friendly and sustainable technology movement. And, again the role of the ECI will be far more important when it will link with the international arena. The World Summit on Sustainable Development held in Johannesburg in August-September 2002 also focused on the role of Engineers in Sustainable Development with special focus on Global Governance, Consumption and Production

Pattern and the Value System. Many of the participants had covered the value system under the over all generic term of spiritualism.

Gujarat Earthquake and Engineering

The year 2001 started with a serious natural disaster when Gujarat was rocked by earthquake on January 26, 2001. Subsequently the year 2001 witnessed the worst kind of man-made disaster, when terrorists attacked the World Trade Centre on September 11, 2001. Every disaster, whether natural or man-made, has taught us something. Sometimes the lessons that lead to a deeper understanding of the real challenges re-pay are only disseminated to a sub-set of our profession. Because our profession tends toward specialization, we often have difficulty translating lessons learned to a broad range of 'disciplines' and 'industry segments':

The Gujarat Earthquake reflected the maturity of India's engineering competence. All structures, properly designed, engineered and constructed withstood the ravages of earthquake. This included the Kakrapor Atomic Power Station; buildings constructed by CPWD / PWD in public domain; and the defence structures built by MES and the runway that helped 1000s of sorties. On the other side where engineering standards were not followed, we witnessed the other tale.

WTC and Engineering

In New York on September 11, 2001, the World witnessed the best of engineering, and not the failure of engineering. The Twin Towers swallowed fully loaded planes. The structures not only endured impacts beyond their design norms but also withstood the ensuing fires; they were not immediately overwhelmed. The buildings were the first of the many heroes that died that day, but only after they had remained standing long enough for as many as 25,000 people to escape. This is the true testament to the designers. In Washington, what was witnessed was again the best of engineering. The Pentagon's resistance to a large scale, direct deliberate assault speaks well of the ability to design critical infrastructure to resist attacks.

Whenever tragedies of this dimension occur they leave a number of lessons for professionals. To learn from these lessons and to incorporate them into future design is very much the need of the international professional community. With a comprehensive understanding and broad distribution of these lessons, one can begin to address the larger consequences of the disaster. Not all of the damage was incurred by high profile buildings in New York and Washington, damage to surrounding infrastructure – transportation, electricity and telephone – exceeded (in economic terms) the damage to the buildings. The very purpose of infrastructure – to tie development together – in some ways limits its ability to resist deliberate attacks.

The incident of September 11, 2001 presented the engineering fraternity with an unusual challenge as well as an unmatched opportunity are response that speak a great deal of people of our heavily engineered environment (our cities), as well as about our profession.

WTO and Engineers' Mobility

The concern for mobility of Indian engineers emerged when WTO started discussions on GATS with the Ministry of Commerce in turn brought into discussion with various professional societies. The Institution of Engineers (India) along with professional Institutions showed concern in dealing with the provisions of GATS. It is relevant to refer to WTO provisions and subsequent actions.

The Working Party on Domestic Regulation (WPDR) that has been established, by WTO, for development of domestic regulations for all services sectors, figures upfront. While currently the work has started for developing systems on a horizontal basis, development of sector specific systems is not excluded. However, the general consensus amongst members has been that it would be more efficient and less time consuming to develop such disciplines on a horizontal basis and supplement them if necessary by sector specific disciplines.

It may also be mentioned that such disciplines have already been developed by the Working Party on Professional Services (WPPS) for the accountancy sector. However, these disciplines are not mandatory and apply only to members, who have scheduled commitments in the accountancy sector. These are important because they provide an indication of the kind of domestic regulations that would be considered as compatible with the requirements of Article 6:4. The Government of India considered that our domestic regulations should be in line with such disciplines.

As part of the working of developing domestic disciplines for all sectors, the WPDR has identified the following issues with respect to the development of domestic regulations under WTO Regime:

(i) Necessity
(ii) Transparency
(iii) Equivalence
(iv) International Standards

The first two areas, 'necessity' and 'transparency', could help to develop rules on domestic regulations applicable to all types of measures listed in respective Articles relating to qualification and licensing requirements and procedures and technical standards.

The other two areas, 'equivalence' and 'international standards' could instead help to develop rules limited to some of the measures in Article 6:4. These are relevant to be discussed in relation to the orientation course.

Engineers' Mobility Forum

The Engineers Mobility Forum set up in 1999 has membership from Australia, Canada, Hong Kong, China, Ireland, South Africa, New Zealand, UK and USA. In addition Japan, Malaysia and Korea have also shown interest and India and Bangladesh are expected to apply for provisional membership of EMF at the next meeting in 2003. The Institution of Engineers (India) was invited as India's representative body to participate in the meeting of EMF in June 2001 in South Africa. The Institution of Engineers (India) has sent its initial application papers in November 2001.

The aim of the EMF is to develop a system of mutual recognition at the full professional level to facilitate cross border mobility of registered practitioners. EMF, therefore, is striving to achieve this for present practitioners, whose educational qualification would not necessarily be accepted through the Washington Accord. In the light of the interpretation of the decision taken at the Sydney meeting in 1999, membership of the Washington Accord is not a pre-requisite for membership of the EMF.

As such the Institution of Engineers (India) can qualify to become a member of the Engineers Mobility Forum, irrespective of its membership of the Washington Accord. However, it will be desirable that NBA and the Institution enter respective bodies at the same time, so that the mobility of professionals becomes easier as their qualifications will be globally acceptable.

The agreement to establish and maintain an EMF International Register of Professional Engineers was formally signed by the member countries in June 2001. The development of understanding between various countries has involved a number of documents, viz., the Memorandum of Understanding and the Agreement itself with its Schedule and the Draft Rules for the International Coordinating Committee.

The Coordinating Committee accepted all the assessment reports submitted by the 11 member countries, after presentation and discussion. This means that all signatories were provisionally authorized to prepare for the opening of the decentralized section of EMF International register, which each country will launch at a date of their choice between 1 January and 30 June 2002. Verification of visits by teams over the next few years will be undertaken to each signatory to convert the provisional authorization to full authorization.

The burning question of “Right to Practice” has been raised, and each country has been requested to prepare a statement about this for their jurisdiction. It is expected that countries that have licensing systems not controlled nationally will have difficulties with granting of the Right to Practice. Indian professional engineers as on date are very vulnerable.

Mr. Pradeep Chaturvedi, is the past-Chairman of The Institution of Engineers (India), Delhi State Centre. He is the Vice-Chairman of the UNESCO sponsored World Renewable Energy Network; and World Environment Foundation, both based in UK. He is President of the Bio Energy Society of India. Mr. Chaturvedi is an expert in Energy and Environment field. He has authored six and edited 25 books on Energy Management and Sustainable Development.

Conclusion

The international scene in the engineering profession can be viewed from the Indian context more precisely with reference to the latest developments, the international scene, India’s diplomatic relationships and our past performance.

During the 10 years, the contribution of the IT Sector was considered important and India’s contribution was globally recognized. The recent growth pattern of IT giants and treatment of our

companies and professionals in smaller countries, like Malaysia and Indonesia, bring forth the issue of how sustainable is our IT growth and whether we should be really entering into the markets which may not conform to the international practices. How should our engineers be behaving?

The second aspect is that since the construction industry took the initiative for discussion under EMF the dominance of issues related to construction industry will continue in any of the discussions of the mobility of Indian engineers. However, caution is required that the construction industry is not considered only to be what is laid down in the Civil Engineering Discipline. Construction industry is far more than that and includes all sectors of engineering disciplines and more important the engineering education for continuous professional development.

The third issue in the context of international situation and international movement is that Washington Accord for mutual recognition or of accreditation is not the end of the world. It is only applicable to 11 countries. It is for AICTE and NBA to really see as to what emphasis needs to be given to the Washington Accord.

The last issue for emphasis is that the Engineering Council of India is not only to cater to the needs of the engineers mobility but it has to really think in the wider perspective of uplift of the engineering profession so that it can serve the humanity more effectively. ECI has to really function through its competent societies and provide guidelines to ensure regulation of engineering profession.

Questions and Answers

Questions-1

In India, anybody from any country can come and do business and set up his / her business here anytime. There are only RBI restrictions. But as far as the Indian setting up business abroad have many technical, legal and other requirements. In India, why are these doors wide open to others?

Answer-1

Mr. R. Gopalan: There is a tremendous amount of opportunities to establish abroad, make investments and deliver services. I don't see any reason why we should lag, because I personally feel that doors in other countries are not closed. Once again the issue, which has come, is intra corporate transferees, what are their qualifications and these issues will play a significant role.

Questions-2

One thing, which I observed in the West was that their professionalisation is strongly, linked with the liability laws of central and state government. In our country, liability laws are very weak. If a building collapses, at that very moment, we shall blame our astrologer rather than the Government or Architect or the Engineer who have built it. Under the circumstances, if the Government starts thinking of way to tighten our liability laws, then the companies would start looking for professionally qualified engineers. Unless there are strong liabilities, laws all the professionalisation being talked about is purely academic. I would like to hear your reaction on this?

Answer-2

I think the situation is not like that as has been depicted. In the last 5 years time professional indemnity clause has come in and the government insists upon professional indemnity when giving out contract to engineers / consultants or professionals. Earlier there was no insurance company which was ready to give professional indemnity cover, today there are atleast three. Most of the largest multinational EPC enjoy the largest insurance towards their professional indemnity.

Participant: I think 'we are looking at not being entering the foreign market easily but foreigners entering Indian market so easily'. It is wrong perspective. Reason being that when we go England or America we are not able to establish credibility that we can supply the goods. But when a foreign company comes into the Indian market the mindset of the people is that anything foreign is better.

Mr. V.K. Agarwal, Session Chairman's Remarks.

I must compliment the organiser for having the theme, of 'Emerging International Scene' for engineers. It is an extremely important issue. It is of great necessity to understand the implication and problems associated in working in countries abroad. I am very happy that this theme has been recognised, its globalisation and is picking importance in India, which is contributing so much to the international community in this field.

As a matter of fact only technical knowledge is not enough. A professional engineers has to be technically competent so as to be a good manager, and a good Human resource man. With globalisation He should have a better vision and should anticipate things. The job of engineers is difficult. They have to work very hard to acquire recognition. When I joined Railways, one was required to be technically upto date otherwise one may not have been able to deliver.

4. TECHNICAL SESSION III: ROLE OF PROFESSIONAL SOCIETIES IN PROFESSIONALISATION OF ENGINEERS

Session Chairman Mr. D.C. Mishra

4.1 Role of Professional Societies: Mr. Jawahar Kaul

4.1.1 Evolution of Engineering Profession

Over the time the practice of engineering profession in developed countries evolved with the spread of the education system, emergence of engineering as an applied science together with the advancement of technologies in different disciplines.

Thus historically, Engineering emerged as an independent professional practice during the first half of the nineteenth century. Prior to that, engineers were hired by the owners or promoters for designing large engineering projects, like ports, highways, irrigation works, railways and buildings. These engineers made rapid advances in design and construction technology and, as are result, gained valuable expertise both in terms of designing methodology as also scientific project management.

Rapid industrialisation in Western countries opened up opportunities for professional engineers to develop, and market, construction and consulting engineering services on a large scale. With the advancement and increase in professional practices business, professional societies/ associations came to be thought as a necessity and were promoted in the early years of the twentieth century to disseminate information, protect the interest of their members, and promote high professional and ethical standards.

4.1.2 Evolution of Profession of Engineers in Developing Countries

As colonial rule stabilised developing countries in South Asia and Africa in the nineteenth century, quasi-civilian governments and public works departments (PWD) came into being. PWDs were responsible for executing projects for the development of agriculture, irrigation, communication, education, health, and other utilities. These PWDs developed expertise in design and construction technologies and executed excellent engineering works like railways, roads, ports, irrigation and building works.

Requirement of mega scale projects led to the creation of new institutions like semi-autonomous public sector corporation with special powers to plan and implement development programmes. In order to support the development of those projects, corporations extensively started using professional engineers, in line with the requirements of multilateral funding agencies.

Sequel of this economic scenario encouraged the development of professional engineering firms in the private sector, other created semi-autonomous public sector consulting firms, for instance, RITES Limited, Engineers India Limited., etc. foreign professional engineering firms were sought to upgrade the technology content for the projects and which encouraged joint ventures with local firms in line with the development ideology of the mid-twentieth century.

Mr. D.C. Mishra is the Managing Director, RITES Ltd. His vision is to make RITES Ltd. a one – stop shop for techno-economic consultancy ranging from concept to commissioning. He has also held important assignments overseas in a number of countries and was the World Bank Consultant in Cambodia. He secured the Gold Medal in his degree course and is the recipient of Merit Award from the Vice President of India.

Mr. Jawahar Kaul is the President of Consulting Engineers Association of India and is a member of the Governing Council of Consultancy Development Centre. He is the executive member of the Engineering Council of India. Mr. Jawahar Kaul is the co-founder Senior Director of SPAN Consultants Pvt. Ltd. and SPAN Travers Morgan International Limited. He is an eminent construction engineer and a Project Management specialist.

4.1.3 Development of Professional Societies in India

The consultancy profession in India started in a recognisable way somewhere in fifties. Consequently Association of Consulting Engineers (ACE) was formed in 1959 while the National Association of Consulting Engineers (NACE) was set up in 1976. These two associations merged in 1996 to form the Consulting Engineers Association of India (CEAI). Today this association is the apex society of professional engineers and promotes the interests of its members and puts forth its view to the government with respect to the profession, taxes and other benefits. It provides a platform for conferring with and ascertaining the views of professional engineers as regards matters directly or indirectly affecting the professional practice and allied issues thereof.

CEAI's activities include framing and maintaining a Code of Professional Ethics and ensuring its observance through self-regulatory measures. It also has promotional objectives which include carrying out sponsoring research on problems relevant to the consulting engineering profession.

In 1985, a scheme for promotion and support to consultancy services was started by the department of Scientific and Industrial Research (DSIR) of the Ministry of Science and Technology, with the objective of strengthening consultancy capabilities in India. A significant outcome of this scheme was the setting up of the Consultancy Development Centre (CDC) in 1986 with the cooperation and support of the following:

- The Association of Consulting Engineers (India)
- National Association of Consulting Engineers

- Association of Consulting Civil Engineers (India)
- Federation of Indian Export Organisations (FIEO)

The overall objective being to enhance the role of consultancy in all disciplines of engineering through variety of interventions which include bringing to the force the need for consultancy on the one hand, and upgrading the competence of professional engineers on the other.

Thus societies/professional bodies came to:

1. Create awareness among the Government agencies about the use of consultancy services.
2. Identify disciplines and areas of consultancy, which would meet the future needs of the country.
3. Focus attention on problems of consultancy development at various levels.

4.1.4 General Characteristics of Consultancy

Consulting / Professional practice industry is a knowledge and specialist know- how of key individuals while outputs are mostly in the form of recommendations, plans, policies and strategies. In India, engineering consultancy is still considered to be a developing phenomena. The three forces which have significant impact on consultancy globalisation, convergence and technology. As a result of globalisation and integration of world economies, there is greater and freer access to market, capital, talent and knowledge. The trade agreement and obligations under WTO have their own implications. We are increasingly going to be confronted by a borderless world that works round the clock and throw up challenges that have to be met professionally for the survival of the consultancy profession.

The main challenge that will confront us in the field of knowledge is the rate of obsolescence of knowledge which is going to be exponentially high. What is implied is that we will not simply be able to keep up with the explosion of knowledge unless the challenge is accepted institutionally. Therefore, it can be seen that to stay in business consulting profession needs considerable support to expand, grow and be competitive. This is specially true in the present liberalised environment, and the onset of expatriate consulting firms in India. Hence these are the areas where professional societies can perform major functions of coordination, streamlining, ethics observance, promote high standard in professional practices and bring in an overall sense of responsibility.

4.1.5 Role of Professional Societies

Professional societies mainly perform two major roles: first and foremost they promote the individual advancement of the individual professions and secondly they protect the professional interests of their members.

Professional societies fulfil both these functions when they maintain standards of quality and ethics among their members. By the certifications, they allow the highest quality practitioners in the field of opportunity to distinguish themselves from the rest, allowing them to charge a premium for their services. This, in turn, makes the hard work required to improve and maintain one's professional skills well worthwhile.

Francis Bacon very rightly said, "I hold every man a debtor to his profession, from to which as men of course do seek to receive countenance and profit, so ought they of duty to endeavour themselves, by way of amends, to be a help and ornament thereunto".

In maintaining standards, professional societies also enable the profession to put its best foot forward. By making available a ready pool of regulated, high quality practitioners, professional societies can improve the overall client experience and foster a strong reputation for the profession among its client. This strong reputation helps the profession to grow, making it more valuable to the society.

The emerging WTO regime affords us, as engineers, the opportunity to define and strengthen our efforts and standards regarding the self regulation of our profession. The benefits from such an effort will be substantial. In addition, to the domestic advantages resulting from increased self-regulatory standards, we expect new markets to be facilitated through this effort. By ensuring that our engineers possess the same skills and professional practices expected by the rest of the world, we can enhance our ability to compete for international contracts and multinational businesses.

Professional standards will be good for our profession and for each of us as professional engineers and also for our clients. It will enhance our ability to compete in the world economy and will be good for our country as well. There is no reason we should not embrace professionalism and embrace it aggressively.

- Take all actions needed for the advancement of the engineering profession in its various disciplines and for enhancing the image of engineers in society.
- Lay down strict norms of professional conduct and take appropriate penal action against failure to follow them.
- Certify the competence of engineers for undertaking professional activities both inside the country and outside and meet all obligations under the WTO charter.
- Ensure the competence of engineering organisations offering consultancy services.

The basic objectives of the organisation would be:

1. Advancement of science and practice of engineering in the country.
2. Cooperation among its members and the Government in evolving a uniform code of professional conduct and ethics to be followed by all Professional Engineers.

3. Certification of competence of Professional Engineers for undertaking engineering activities inside the country and outside.
4. Certification of competence of Consulting Engineers for providing engineering services to clients inside the country and outside.

Engineering Council of India (ECI) now formed as a Confederation of Societies to our minds, is the professional body that is ideally suited to meet the envisaged roles as given below:

- To promote the science and practice of engineering for national development, collectively alongwith constituent members.
- To encourage engineers to serve the need of the society.
- To promote advancement of education and training of engineering to upgrade the quality of engineering professionals in the country.
- To identify and undertake the activities of common interest to the engineering profession.
- To encourage inventions, investigations and research and promote their applications for development of the national economy.
- To identify and undertake activities directed to enhance prestige of engineers in the country, and to secure for them their rightful place at various levels of planning, administration, etc.
- To assist Association / Professional Societies in normalising criteria for membership so as to make these nationally equitable and internationally.
- To establish a common Code of Ethics for adoption by Associations/ Professional Societies and to evolve the strategy for its enforcement.
- To represent engineers and engineering professionals of all disciplines, at national and international levels.
- To act as a Nodal Body, representing India, for bilateral/ multilateral recognition of a National Register of “Professional Engineers” and National Register of “Consulting Engineers” on mutual and reciprocal basis.
- To identify and encourage the implementation of best practices for the preparation and assessment of engineers intending to practice as professionals in domestic as well as foreign markets.
- To standardise criteria to be adopted by the Associations/ Institutions for according status of “professional Engineers” and “Consulting Engineers” and to accord license/ accreditation to practice engineering in India, amongst others.

4.1.6 Conclusion

Consultancy / professional practice is as much of business as service of manufacturing and require all the skills and tools of management that are needed to run any other business. One of the important focus of consultancy is in the rapid expansion and setting up world class infrastructure, optimising, in the design and engineering of products and plants leading to economy, safety, good practices in project management and quality. Primary responsibility for

this role envisage upgradation of skills and expertise to operate effectively at the contemporary international level. This involves training, awareness programmes, interaction meets, international seminars and trade fair participation, consultancy management education, creation of data base on consultants, newsletters and skill upgradation, to mention a few. All these can be effectively managed by a professional organisation. It is in this context of quality of professional services and accountability of professional engineers that there is an urgent need for coordinating activities and responsibility through a professional organisation who will develop a uniform code for regulating the conduct of Indian professional engineers both within the country and abroad.

4.2.1 Development of Modern Society by providing input to the following for betterment of the society

- Role of Government
- Role of Public
- Long term regulation
- Societies in different fields
- Social responsibilities

4.2.2 Professional Societies Input to Government. These inputs include:

- Review of Plan document
- Technology change
- HRD
- Re-engineering
- Simplification of procedures
- Adjudication

4.2.3 Professional Societies Input to the Public by:

- Educating Masses
- Professional Management of Business
- Quality Management
- Trained professional and workman
- Safety and environment

4.2.4 Engineering Council of India has done wonderful work in one year. We sincerely hope that it will work in the interest of the

- Registered society in transition
- 24 Societies as members
- Developing regulatory documentation

- Heading for a body under Act of Parliament

Mr. K. B. Rajoria, is former Engineer-in-Chief in Govt. of Delhi, He is Past-President – Indian Building Congress, Indian Roads Congress and past-Chairman Institution of Engineers (I), Delhi State Centre. He has several awards to his credit including gold medal for outstanding services in remote and difficult areas of Arunachal Pradesh. Mr. Rajoria is an expert on Management of Civil Construction Projects.

4.2.5 The Institution of Engineers has played an important role in the past and it can now contribute in the:

- Continuing education
- Advising Government
- International coordination

4.2.6 Societies broad set up includes Societies Act and Objectives – profession, field, technology, its Members can be permanent, institutions, government bodies, private sector, it has Office bearers & Executive Committee, it organises Conferences, training, etc., and has Publications.

4.2.7 Other Prominent Societies are

- Indian Building Congress.
- IRC – extended arm of Ministry
- Valuation – Good cause but holds
- Engineer Arbitrators – Peruse cause
- CCPS – Product and Services
- Contractor's Association

ECI has to play an important part to regulate the societies so that societies can serve the public. In our countries there are societies, which can help to improve the prestige of their members and fulfil the social cause.

4.2.8 Conclusions

- Prestige of membership
- Societies of other countries
- Other services
- Fulfil social cause

4.3 Role of Professional Societies: Brig. S. V. S. Chowdhary

The formal engineering education caters to the initial training and expertise which is needed by engineers to launch themselves in the profession. But with fast changes with technology, learning and updation of knowledge is a life long requirement. Such updating of knowledge, by receiving inputs throughout the career, is necessary for engineers to attain their professional expertise.

Brig SVS Chowdhry is a Consultant at the Centre for Development of Advanced Computing, Noida. He is Past-Chairman of the Institution of Engineers (India), Delhi State Centre, Computer Society of India (CSI) and the Institution of Electronics and Telecommunication Engineers (IETE). He is former Commandant, Army Headquarters Computer Centre at the Army Headquarters. He is a Distinguished Fellow of the Institution of Electronics and Telecommunication Engineers (IETE) and a Fellow of both Computer Society of India (CSI) and the Institution of Engineers (India).

The ECI was formed by the coming together of a large number of professional societies and institutions. It requires the support and cooperation of all member organisations for the introduction of a greater degree of professionalism amongst engineers. Professional societies can play an effective role in providing the inputs by:

Role of Professional Societies:

- Organisation of technical activities for the advancement of the engineering discipline.
- Conduct of basic engineering and continuing technical education programmes.
- Providing an opportunity to the members to upgrade the membership status.
- Publication of technical literature.
- Institution of awards to honour outstanding professionals.
- Promotion of R&D.
- Evolving a Code of Ethics for the members.

The Institution of Electronics and Telecommunication Engineers (IETE)

Founded in 1953, the IETE is a leading professional society devoted to the advancement of Electronics, Telecommunications and Information Technology. Having completed fifty years, the Institution is currently celebrating its Golden Jubilee. Has nearly, 45000 members spread over 41 centres. One of these centres is located abroad at Kathmandu.

- Main objective of the IETE.
- Conduct of technical activities for the advancement of Electronics, Telecommunications and Information Technology.
- Discussion of national policies in the related areas for inputs to the decision makers.

- Organisation of basic engineering and continuing technical education programmes for HRD.
- Provision of facilities to the members to update their professional skills.
- Publication of technical literature.
- Assistance in the formulation of national standards for products and services in the related areas.
- Institution of suitable awards for honouring outstanding professionals.
- Promotion of R&D in the related areas.
- Encouraging inter-disciplinary interaction with other organisations both within the country and abroad.
- Evolving a Code of Ethics to be followed by the members.

Continued Knowledge Upgradation

IETE organises a number of activities to develop technical skills and professional competence amongst its members:

- Annual Technical Convention.
- Mid Term Symposium.
- International Conferences
- Memorial Lectures
  - Bhabha Memorial Lecture.
  - Vikram Sarabhai Memorial Lecture.
  - Sir J C Bose Memorial Lecture
  - Sir C V Raman Memorial Lecture

- Seminars/ Workshops
- Exhibitions
- Opportunity for publication of papers.
- Opportunity to refer to technical papers in libraries.
- Interaction with the Industry.

IETE Grades of Membership

- Honorary Fellows
- Corporate Members
  - Distinguished Fellows
  - Fellows
  - Members
  - Associate Members

- Student Members
- Organisation Members

- Others
  - Diploma Members
  - Associates

- Professional Manpower Development

IETE Examinations

- DIPIETE (since 1987). Recognised for subordinate posts by the Government of India and several State Governments/ UTs.
- AMIETE (since 1956). Recognised for superior posts by the Government of India / UPSC and several Universities/ institutions for the Post Graduate Studies.
- ALCCS (Advanced Level Course in Computer Science – since 1982). Recognised as equivalent to M.Tech in Computer Science.

IETE Board of Examination. Conducts examinations at 32 examination centres in India.

IETE Publications

IETE is widely recognised as a leading publisher of literature in the field of Electronics, Telecommunications and IT. Its publications include journals, books conference proceedings and other electronic media displays such as:

- IETE Journal of Research (Bimonthly) for dissemination of original research work.
- IETE Technical Review (Bimonthly) for updating technical knowledge.
- IETE Journal of Education (Quarterly) for students.
- IETE Newsletter (Bimonthly) gives useful information for corporate members.
- IETE Book Series jointly with Tata McGraw Hill and National book Trust.
- Conference Proceedings.

Research Related Activities

One of the major objectives of the IETE is to encourage R&D in the related areas. It has been recognised as a Scientific and Industrial Research Organisation (SIRO) by the Department of Scientific & Industrial Research of the CSIR. The IETE endeavours to stimulate R&D through following activities.

- Publication of Journal of Research for disseminating original research papers.
- Publication of proceedings of International Conferences and other important technical events.
- By setting up research seats in areas such as:

- o Emerging Wireless Technology (by TTL)
- o Microwave Engineering (by IRSI)

Code of Ethics

The IETE has laid down a comprehensive Code of Ethics. All members on admission to the IETE has to give an undertaking to abide by this Code of Ethics.

Conclusion

With illustration from IETE, the speaker highlighted that the member organisations of the ECI can play on effective role in the professionalisation of the engineering community by providing an opportunity to their members to retain the quality and relevance of their expertise.

Questions and Answers

Mr. D.C. Mishra: Session Chairman's Remarks

Just to kick start the discussion, I may mention the role of professional society, which has so far been related in encouraging students participation in professional activities, support curriculum, development of sports activities, has become much more important with the activities now started by the ECI. I think it has become now necessary for these professional societies to advocate the engineering profession to common view point on issues of importance to the nation and profession. They should also contribute effectively in the shaping of public policy, public awareness, team building and forming consensus on important issues. We have to guide the engineers in such a manner that engineering should be practiced with highest degree of professional ethics. It includes the quality of life and benefit to the society.

Questions-1

Earlier in the morning, it was said by Prof. Ashoka Chandra that some decisions will be taken in the evening during the Board of Governors Meeting and the conference is summing up tomorrow. I understand from this that ECI takes it decision without regard to or reference to the view of the conference. Similarly he said in a few days we will be having the first list of Professional Engineers. I am the member of 5 or 6 member associations of ECI and no one has asked me, what are the criteria required for the recognition of the Professional Engineer. It seems to me that ECI is functioning like a super bureaucracy as it is not concerned with the view of the members. Would somebody tell me that what is the role of professional society in the functioning of the ECI.

Questions-2

I have headed three societies in fine position, I have a few remarks to make. ECI should have gathered the whole list of professional societies operating in India and I think should have seen that whether

these things are functioning as professional societies or not. I think this meeting should have been little more serious view.

Answers- 1&2.

Mr Jawahar Kaul: ECI was formed primarily by the confederation of 24 Societies. It is even today open to all professional societies/ bodies to join it. ECI has never forbidden any society or any recognised institution to join ECI. It is inevitable that ultimately more societies will join them. The basic question was to quick start to meet the WTO regulation. It was a no easy task, but you can be rest assured that ECI will welcome all the societies who have a role to play and it is not a sort of close door affairs, it is an open transparent affair. The problem arose because of time limitations and it had to be in conformity with various government decisions, which will propel the ultimate drafting of engineer bill and put it in the parliament.

As far as the today's Board of Governors Meeting is concerned, it has been well thought of and well intended because certain decisions have to be taken not only as consequence of the seminar but also consequences of certain other requirements from the Commerce Ministry and nodal Ministries. It is being taken up very seriously. You are welcome to join the Board of Governors Meeting and convey your view on the criteria for the registration of Professional Engineers. You can send in your suggestions now also. ECI has received views from other people. ECI routes all the circulars and the issues through their societies, it the duty of the society to further channelise these questioners or view points.

Question-3

It has been pointed out rightly by Mr. K. B. Rajoria that continuous education is very important. Now a days industry are employing people who are not right for the jobs as a result poor product quality is there. Last week I visited Coimbatore, there are about 300 foundries but only three metallurgists were working on that. In fact we have conducted a course in which about 70 members participated and if you see the response and the fundamental aspect of metallurgists, it was pathetic. There is a need for a fundamental course to teach to those who are in profession. The American society in India has set up three chapters one at IIT, Chennai, IIT, Kharagpur and at Coimbatore recently. They are selecting some of the candidates for the leadership courses. Such type of programmes should be introduced in each professional society and the educational institutes should start these programmes from the second year of engineering onwards.

Answers- 3.

Mr Jawahar Kaul: It is one of the main aims of ECI to promote the system of continuing education. We will also in a course of time, formulate the policies as far as the quality of the education is concerned. Professional education will need to be improved many fold particularly in the context of the international business, if we are seeking to go abroad this has to be done, but it will take time. There have been various committees set up to develop the systems of continuing education. We have to

work something on these lines. These things had been included in the agenda and manifesto of ECI and it will take some time.

Mr. D.C. Mishra: I would like to make two points regarding the role of professional societies.

1. Monitoring the job requirements to help the universities, corporations and government to find actually how many engineers are required for the domestic and foreign market and can programme the courses accordingly.
2. Creating public awareness and providing greater understanding and appreciation and let people know how engineering contributes to the economy, environment, social security and well being of the people.

5. TECHNICAL SESSION IV: ROLE OF INDUSTRY/ CORPORATE/ GOVERNMENT/ CONSULTING ORGANISATIONS/ UNIVERSITIES/ FINANCIAL INSTITUTIONS/ EDUCATIONAL & RESEARCH INSTITUTES, ETC.

Session Chairman: Mr. G. D. Gahia

5.1 Role of Organisation in Professionalisation: Mr. K. K. Kapila

5.1.1 Development of Engineering Profession.

It involves-

- New Method – Incorporated in design, construction and manufacture
- New Concept – Innovation, R&D, pilot stage, transfer from 'Lab to Land'
- New Material – Durable, cost effective
- New Software – Enabler to improve efficiency

5.1.2 Areas of Engineering Discipline.

These include-

- Infrastructure – Industrial, public and residential buildings
- Transportation – Road, railway, shipping, airport
- Water Resources – Dams, barrages, canal, cross drainage works
- Urban Utilities – Water supply, sewerage, gas pipelines
- Power – Generation thermal, nuclear, hydro, transmission, high voltage, HVDC
- Non Renewable Energy Sources – Solar, photo voltaic, wind, geothermal
- Ocean Development – Tidal power generation
- Telecommunication – Telephones, exchanges
- Bio Engineering – Medical equipment
- Space Travel – Satellite design, space station
- Environment – Environment management, environmental impact assessment
- Others

5.1.3 Activities of Engineering Consultancy.

It provides plan, design, development and technologies of a particular project or product. Consultancy activities cover:

- Knowledge based

Mr. G. D. Gaiha is Chairman & Managing Director, TCIL. After obtaining Engineering Degree from Banaras Hindu University in 1968, he joined Telecommunication Service. During his

distinguished career in Department of Telecommunications, Mr. Gaiha has held various assignments in Telecom Districts, Circles and Headquarters. Mr. Gaiha has also held the position of Director (Technical) in M. T. N. L. Board for almost four years from 1998.

Mr. K. K. Kapila is the Chairman and Managing Director of the International Consultants and Technocrats Pvt. Ltd. (ICT) and Vice Chairman of Consultancy Development Centre. In 1995, ICT under his leadership, ranked as number one consultancy organisation by Asian Development Bank. ICT operates in more than 20 countries and is listed among top 100 consultancy companies of the world. He was conferred upon New Century Award as a Member of "The Global 500". Recently, he was selected "Man of the Year 2001" by the American Biographical Institute and its Board of International Research, for "his outstanding accomplishments to date and noble example he has set for his peers and entire community".

- Project and product life cycle
- Conceptual design and feasibility
- Selection of technology
- Feasibility analysis
- Investment appraisal
- Plan development
- Design & development
- Evaluation of proposal
- Contract procurement
- Execution, installation, commissioning
- Operation and maintenance
- Selection of personnel
- Training and skill upgradation
- Incentive linked to performance

5.1.4 Role of Industry / Institution.

It performs two specific roles:
- Regulator
- Facilitator

5.1.5 Industry and Institution Facilitate.

It provides platform for.
- Public safety
- Social order
- Environmental safeguard
- Professional quality
- Strengthen professionally individual & organisation

- Develop competency
- Develop integrity and ensure ethical fulfillment
- Follow code of ethics
- Provides platform to operate
- Adoption of new system & procedure
- Mutual Obligation and Trust
- Test and refine

5.1. 6 Summing up.

It is important -

- To follow professional standards
- Code of conduct and ethics
- ECI to
  - Foster cultural and mind set change
  - Enforce and monitor

Mr. G. D. Gaiha, Session Chairman:

I would like to say in this environment of competition, where regulation has become order of the day, credibly of the professional has become most important thing in the international market and we have to survive in this situation by becoming more accurate and more technology oriented in our profession attitude. As myself being from the consultancy firm, I know how the margins are substantially coming down in the field. Implementation timeframe has become an important aspect of this. Monopolistic situation is ending in today's scenario.

5.2 Role of Educational Institutions: Prof. D. V. Singh

5.2.1 Role of Educational Institutions

- Educational institutions must prepare students more effectively for careers as Professional Engineers.
- The students before they graduate should also be knowledgeable about WTO regime and its implication.
- What attributes should be imbibed in the future graduates for competencies required by PEs in WTO regime?

5.2.2 Attributes to Be Imbibed In the Future Generation of Engineers

- Engineering & Technological competence
- Creative problem solving skills
- Learning to be a life long learner

- Ability to continue to grow
- Ability to mature rapidly
- Acquiring wider interests
- Ability to take risks
- Communication skills
- Ability to deal with people
- Professional conduct and Ethical values

5.2.3 Issues to Be Resolved

- Whereas there is a general acceptance of attributes, there is little agreement or efforts on what should be done and how to imbibe the attributes.
- Why is it so?
- The attributes look abstract.
- IIIT Calcutta has established a centre for corporate professional development.
- A number of such centres are required.

5.2.4 Major Changes In Global Networking

- Vertical integration no more an effective approach.
- Changes are stimulated by
  - Demands for technology
  - New market

- Conditions of competitiveness

Prof. D. V. Singh: He is the Vice-Chairman, Indian National Academy of Engineers and Member of the Board of Governors, Engineering Council of India. He was the Vice-Chairman of Indian Technical Education, Vice-Chancellor of University of Roorkee and Director of IIT, Roorkee. He has published 160 research papers in national and international journals and conference proceedings. His research has also got him several awards including the Shanti Swarup Bhatnagar Prize

5.2.5 Turnaround In Global Cooperation

- Regional networks for production of High Value Added Goods and Services.
- Cooperative Research, Production and Marketing.
- Interlinking of companies.
- Corporate boundaries disappearing.
- Reach to market place.

5.2.6 The Level Playing Field

- Industries ask for level playing fields
- The play also depends on
  - The Players
  - Rule of the game

- Engineers do most of the legwork for which they need technology skill.
- On the economic turf we should have our game plan.
- We should win not only on our home wicket but also on wickets abroad.
- A synergy between PEs and academic institutions will strengthen our game.

5.2.7 The Service Sector

- Services will be one of the most dynamic growth sectors.
- Service sector will play a major role in job creation.
- There will be a continued and permanent move towards higher value added operations.
- The service sector will grow more and more in
  - R&D and Consultancy Services
  - Software Development
  - Networking
  - IT Services

- Economy and societies will be increasingly knowledge-based and highly networked.

5.2.8 WTO Regime Puts a Demand on PE

- The professional engineers will have to cope with the emerging WTO regime.
- PEs will require updating and upgrading of knowledge and competencies.
- Competencies not only include what one knows but also knowing from where knowledge can be acquired.
- Academic institutions will have to be one of the important sources from where PEs should be able to acquire knowledge.

5.2.9 Technology For Competitive Edge

- New technologies and new technology applications will lead to keener competition for
  - Goods
  - Services
  - Capital
  - Locations for Investment

- This will require
  - Qualified Engineers
  - Skilled Workers
  - Good Infrastructure
  - Good Economic Climate

- One of the main driving force for development in the changing world will be technology.

5.2.10 Educational Institutions As Knowledge Resource

- Educational Institutions can make significant contributions to the continuing Professional Development (CPD) of PEs:
  o CPD service provider
  o Organize professional training programmes

- Open-Ended
- Specialized
- ECI Approved
  o Create websites offering learning opportunities to PEs and CEs.

- Educational institutes can keep a technology watch and vigil to create new opportunities.

5.2.11 CPD courses should blend other topics with the core technical content

- Technology trends
- Economic and industrial trends
- General subjects
  o Project Management Techniques
  o Safety Management
  o Contract Management

- Professional Ethics
- Environment Issues
- WTO Regime
- ISO Certification
- Relevant Laws

5.2. 12 Educational Institutions Teeming With PEs and CEs

- Competitive edge depends on multifaceted technical knowledge.
- Tacit knowledge is becoming more important.

- Capturing technology and integrating it with tacit knowledge to convert technology into competitive products.
- Sources of tacit knowledge and sources of the latest technology knowledge must merge.

Mr. G. D. Gaiha Session Chairman:

I think Prof Singh has set the theme because the seed of professionalism can be only developed in the engineering institutions and what we are getting as products from the engineering colleges have to be nurtured from the professional point of view. Education system, which prevailed earlier, was not compatible to what we are facing today. We have to merge the techno-economic system. Techno-economic system has to take place because technology alone cannot survive in this competitive environment, it has to be the economy also which one has to understand before he enters into the market frame. Basically in the educational institutes we have to develop and make students understand what regulatory environment, economics of the technology and how long this will survive in this competitive market. Technology is rising at a fast rate that if we are not adopting to the change, new technology will take place. The telecommunication sector completely depends upon the adoption of the new technology.

Quality is also an important aspect because in the competitive market we cannot sell what we are producing, we can sell with the quality. Earlier subscriber had no choice but to adopt the product produced by the telecommunication department. The state of monopoly which has disappeared in many sectors has to be kept in mind, while making the syllabus for the education institutions you will have to compete the quality order of the day.

Let there be a healthy debate on various aspect on the adoption of the technology keeping in mind the economy and the user that we are in a position to survive in the market.

As said by Prof. D.V. Singh that there are groups who are coming out of the engineering colleges and making consultancy organisations, these things are very good for the development of the economy, because these are the persons who can deliver goods at a very compatible prices in the market. We should promote these type of mavericks so that they just go out and be successful in the domestic as well as international market and to find their place in the international forum.

Other point is of the WTO regime and the regulations which are taking place. New adoption in the regulatory environment plays a very important and crucial role and we have to find which technology is going to be the best technology with which we would be able to survive in the market and be successful if this thing is properly deliberated and adopted, I am sure the subscriber will be extremely happy if these things are done in an efficient and cost effective manner.

I think this lecture of Mr. Singh was of great importance from the point of view of the seminar as the seed comes from the engineering institutions. Educational curriculum has got to be oriented from the point of view of the changes of the new technology and as in the earlier times only one paper on

economics in four years of engineering will not be enough. We will have to orient our syllabus and lot of things have to be added to the curriculum.

5.3 Role of Industry & Academic Institutions: Dr. R. Kapur

In India, we have a proliferation of associations of Engineers, Consultants, etc, unlike in Medical and Architecture field which have their own council to regulate the profession. In developed countries and some of the Asia Pacific countries there are councils which provide accreditation as 'Professional Engineers'.

Engineers Council of India (ECI) established in April 4, 2002 has done a commendable job to synthesise various associations to achieve a unique status as a apex body to maintain National Register of Professional Engineers and look after their other interest.

In my opinion Academic and Industry Interaction, must begin at the student level. In 2nd, 3rd and 4th year of graduate level education, there should be atleast 2 months of Industry exposure and training. Similarly, the academicians also should work in the Industry for atleast 2 months in a year. Engineers from the Industry should also have a tenure of atleast 2 monhts every year in the Academic Institutions, these steps will go a long way in improving the quality in both Academicians and Industry, Education will become more of applied nature, Students will have enormous self confidence on entry to any profession.

Faculty in academic institutions must be encouraged to take up consultancy jobs to appreciate, understand and work out practical solutions.. similar exposure by practicing engineers into teaching and research will be very beneficial to improve their theoretical base resulting in more scientific solutions. Even the course content may get modified by such interaction.

Let's now look into the problems of WTO regime, which is round the corner and will push our doors open in 2005. Every graduate / diploma engineers will have to get registered as Professional Engineer in the National Register for even working in India. For foreign assignments it will be absolutely mandatory. Registration will not only take into account the Academic qualifications but also the experience in the practical field. It will be a mammoth exercise which may require grooming of candidates by some specialised private agencies similar to ISO accreditation consultants.

R. Kapur After obtaining the post graduation from the Indian Institute of Sciences, Bangalore (BCRI), he joined Central Building Research Institute (CBRI) Roorkee as Senior Research fellow. He was promoted as Scientists and then as Senior Scientists during his 7 years tenure at CBRI. He also obtained a Doctorate degree from University of Roorkee during this tenure. He co-promoted Unitech in 1972 alongwith 3 other scientist from CSIR. Unitech from a meagre beginning with Rs. 50,000 equity now has Rs. 150 crores reserves and Rs. 425 crore group

turnover from Engineering Construction, Real Estate/ Hospitality and Education Sectors, Development and Amusement Parks.

Questions and Answers

Question-1

I personally feel that the education is rather simpler process and not many of the things are to be worried about. If teachers and students work as a team, where both players are healthy and committed, and not much has to be described. In training, mind has a role to play and memory function is important. If you inculcate these attributes in an individual, you bring him to a stage where he is talking of creating information by the process of using the acquired information. This is what we need to inculcate in our professionals.

Answer-1

Prof. D.V Singh: You have proved my point describing this attribute. Why we could not integrate this in our education system we do not know, we have to do something.

Question-2

What we have been talking is alright but has any one thought of bridging the gap between the professional engineering and educational institutions.

Answer-2

G.D. Gaiha: Curriculum which we are making, has to be a mix of many things. Despite the fact that time is very limited in the engineering curriculum of the academia. This mix should be developed in consultation with the industries and some of the important institutions, which are practically working in the field of engineering.

6. CONCLUDING SESSION

Session Chairman Mr. R.V. Shahi:

In India, we do have more than a million engineers and more than three lakhs engineers come out every year from the institutions. In any county and particularly in a developing country, engineer's role is one of making the country– making right infrastructure, creating different facilities and contributing significantly to improve the quality of life and standard of living. We are one of the few nations, which have nuclear and satellite systems. Very few countries have achieved that level of excellence. But at the same time, we do have a problem of drinking water. We want our children to have Internet but we don't have basic infrastructure. Therefore, India thus presents a conflicting picture of reaching the peak of development confronted with such fundamental issues and that is disturbing everyone.

I would feel that an organisation like ECI would be of national importance and would do national service, in fact international services to many of the engineers who are going abroad. There is need to have performance interaction, technical interaction, professional interaction and some degree of control on the activities of the registered engineers.

I congratulate the organisers of the conference and also thank them for giving me the opportunity to be a part of this.

6.1 Summary of Proceedings: Dr. Uddesh Kohli

6.1.1 Inaugural session

- Raising quality of engineering education.
- Promote science and practice of engineering and role of society.
- Knowledge explosion- engineering to update knowledge, skills, social consciousness and leadership.
- Indian talent- future for tomorrow.
- Engineers to convert dream into reality.
- Engineers to be role model for efficiency, quality and accountability.
- Demand for competent engineers worldwide.
- Coming together of Professional Associations of Engineers- great achievement.
- Important role of ECI for the engineering profession.

6.1.2 International Scenario

- International Accords WA, EMF etc.
- Take advantage of opportunities through WTO/GATS.
- Acceptability of our educational programmes and accreditation.

- Registration of Professional Engineers.
- Joining EMF and ensuring mobility.
- Registration of Consulting Organisations.
- Marketing efforts.

Shri.R.V. Shahi, Secretary to the Government of India, Ministry of Power, is a highly qualified engineer. He has over 35 years of professional experience. He was Chairman and Managing Director, BSES Ltd. for about 8 years. He was closely associated with industry bodies viz. CII, FICCI, ASSOCHAM, IMC etc. He is on the Boards of Governors of IIM, Lucknow, MDI Gurgaon, Xavier Management Institute, Bhubaneshwar. Shri. Shahi has received various National and International awards including the CBIP Golden Jubilee Award, Gold Award of Institute of Economic Studies, Rotary Award for Corporate Governance, Distinguished Engineers' Award from Institution of Engineers, "Top Professional Manager Award" and "Best Power Man of the Millennium Year 2001" Award.

6.1.3 Issues Facing Engineering Profession

- Shortcomings in initial educational process.
- Fast changing requirements of Engineers.
- Inadequate emphasis on Continuous Professional development.
- More focus on procedural audit, very little on performance audit.
- Insufficient /Inadequate synergy between, owners, Architects/Designers/ Builders.
- Our national standards not keeping pace with new developments.
- Insufficient focus on Attitudes, Values, Leadership and self improvement.
- Lack of multi-disciplinary training and approach.
- Implication of laws, regulations, professional liabilities.

6.1.4 Role of Professional Societies

- Advancement of engineering profession.
- Enhancing image of engineers.
- Norms of professional conduct.
- Organisation of technical activities.
- Conduct of continuing development programmes
- Publication of technical papers.
- Recognition of outstanding professionals.
- Inputs to govt. policies, public and social needs.
- Create awareness in the society.

6.1.5 Role of Institutions, Industry & Organisation

- Provider: New methods, concepts, materials and software.

- Facilitators: Public safety, social order, environment, safeguard and professional quality.
- Trend setters: Professionalism, competency, integrity and ethical conduct.
- Change agent: Cultural and mind-set.
- Education and Training: Learning, problem- solving skills, continued development, communication skills, dealing with people and leadership.
- Bridge gap between educational and research institutions and industry.
- Panel for Discussion

6.2 Quality of Education: Prof. Indiresan

Prof. Indiresan was the Director of IIT, Madras, President of Institute of Electrical and Telecommunication Engineers and Indian National Academy of Engineers. He has over 40 years teaching experience. He has been involved in the career development of number of eminent engineers and has conducted associative research assessment and has to his credit many published journals. He is also the recipient of Padma Bhushan.

One of the major concerns that I have expressed in the past few days is about the quality of education. I had an occasion to listen to a great engineer, who said that with more and more engineering colleges, automatically quality will go up. Yesterday Karnataka Government has decided that with the 35% marks, admission in the engineering colleges can be done. In the past 50 years, we had no control for our own profession, no control for ourselves, we are truly second-class citizens.

We need to have the freedom of autonomy to do our professional work without the interference of others. Believe it or not, IIT has considerable degree of autonomy. Director of the IIT can convert every lecturer post to the Professor Post without going to the Government, some how or the other, autonomy has been incorporated into the Act. But once this freedom was given, it was with self-restraint that the system worked well.

There is no investment in the research and development projects. In a science department, the budget is something about Rs.10 crores, typically 2%-3% should go to Research and Development. But, he may find it difficult to convince the finance ministry. My question is why he should convince the finance ministry, it should be his budget and he should be able to do it in his own manner. Finance ministry can say this is the budget but how the budget is spent depends upon the R&D person.

There are two factors which have to be seen:

1. We are not investing in knowledge.
2. We don’t have the freedom to do so.

Now, one main point is that we do not have a good reputation. This, we have to rectify and present ourselves as good engineers. This unfortunately is the fact of life and I say with deep regret that we have not looked into this aspect.

Now, another point is of the brain drain. There are two types of brain drain.

a. People who go abroad, I remember a statement made by Mr. Rajiv Gandhi that it is better to have a Brain drain rather than the brain in the drain. This is the most self-demeaning statement by the Prime Minister of the country. If these things do happen in India, we should strongly protest against most of this very attitude of the people even at the highest post.

b. Why this is happening, why so many people are going, there is a principle in economics law of comparative advantage. For example, training of engineers in IIT would cost four lakhs and to buy a PC it costs about Rs. 50,000 i.e. one IIT engineer would be equal to 8 PC's, whereas in America the cost of one engineering student would be $150,000 and for a PC it would cost $1000= 150 PC's. So the Indian would say that lets have a trade you send us 30 PC and we would send you the engineers, we would also think that we have done well, instead of 8 PC's we have got 30 PC's and we are richer four times. To American it would cost about 150 PC's to produce an engineer but we have got it for 30 PC's, we are five times richer. We give much value to the machinery and not for the person who is producing that machinery.

   Christianson, editor of IEEE has said that a country, which values its engineers and gives them physical income, will have no difficulty in competing in the world in international trade and new technology. Physical income means respect and honour.

6.3 Professionalisation of Engineers: Mahendra Raj

I am sure by now all issues relating to "Professionalization of Engineers" have been discussed in detail in the preceding four sessions. However, certain issues need to be emphasized, and I will make an endeavour to dwell upon these.

First, I would like to refer to the definition of "professionalisation" as given in the brochure of this Conference. It states "professionalisation of an occupational group has two connotations, namely, quality and relevance of knowledge and skills, and enhancement of contribution to society". The brochure goes on to state that this Conference has focused on the former aspect only, that is "education training and expertise of individuals".

I would like to touch upon the second aspect also, that is, "public awareness about the role and work of the professional engineer and his image in the vision of the people". I strongly feel the two issues are inseparably interlinked. In my opinion, Society has a big stake in professionalization of Engineers, because contribution of the Engineering profession to the

advancement of the Society and the development of the nation is significant. All Industrial activities including manufacture of consumer goods, infrastructure facilities (such as roads, railways, airports, shipyards), transportation, telecommunication (including internet and satellite communication), computer software & hardware, to name a few, all require basic engineering inputs. Engineers thus play a major role in enhancing health, wealth, happiness and safety of society.

It is in recognition of this role of Engineers that the Government, way back in 1958 adopted a "Scientific Policy Resolution" which states

"The key to National prosperity, apart from the spirit of the people, lies in the modern age in the effective combination of three factors – TECHNOLOGY, RAW MATERIALS and CAPITAL, of which the first is perhaps the most important, since the creation and adoption of new scientific techniques can, in fact, make up for a deficiency in natural resources and reduce the demands on capital. But technology can only grow out of the study of science and its applications".

This is the period when IIT's were being setup. Again, concerns regarding acceleration of the process of development had prompted the Government to set up the Barve Committee under the auspices of the Planning Commission in 1970 to encourage and strengthen "Technical Consultancy Services in the Country"

Mr. Mahendra Raj is the member of a high-powered committee set up by the Ministry of Urban Development and Poverty Alleviation of the Government of India to draft a Comprehensive legislation to Regulate and Control the Activities of Builders and Developers. He has many 'firsts' to his credit. These include the first skyscraper in Bombay, first large span folded plate structure, the first large span Industrial Structure for the Hindon River Mills in Ghaziabad.

In recognition of his contribution to Structural Engineering, he was elected President of "Indian Concrete Institute" for 1987-89. He received the "Architectural Engineering Design Award" from the Institution of Engineers (India) in 1989-90, the "GOURAV Award" from the Association of Consulting Civil Engineers in 1991, "Architect of the Year Awards" in 1995, 'Life Time Achievement Award 2001' from the Indian Concrete Institute and "Scroll of Honour" from The Institution of Engineers (I).

This is the Committee which had first talked of the role of professional societies in development of Consultancy Services, and also of the need of an Engineer's Bill.

Later, these very concerns had prompted the Government to adopt a "Technology Policy Statement" in 1983, which reiterates the linkage between science, technology and poverty alleviation. Some of the statements of this Technology Policy are:-

"Political freedom must lead to economic independence and the alleviation of the burden of poverty. We have regarded science and technology as the basis of economic progress….".

"The use and development of technology must relate to the people's aspirations. Our own immediate needs in India are the attainment of technological self-reliance….".

"It is obvious that the importance of a strong technological base for a developing country cannot be overrated. It is the key which has the potential to usher a country into an era of prosperity. But the other two factors, that, is raw materials and capital, also have their importance".

Despite these concerns of the Government, the Nation was not developing a strong technological base fast enough. There were time and cost overruns on developmental projects. Indigenous technologies were not keeping pace with worldwide rapid developments. There was constant need of importing technologies. The Society and the Government were unhappy with Engineers. Engineers were unhappy with themselves. The entire professional environment in the country was becoming a major cause of frustration for all – including the Engineering Profession. Something had to be done to uplift the morale of Engineers and thereby stimulate acceleration of country's development.

This was the time that the Association of Consulting Engineers (India) first suggested that in order to accelerate the growth of a strong technological base it was essential to regulate the profession of engineering so that only engineers of very high caliber reached the top decision making level. We in ACE (I) had argued that pre-requisite of a professional of high caliber are:-

(1) High achievement in academics,
(2) A period of effective practical training,
(3) Another period of experience in the specific field of specialization under the guidance of a competent senior and
(4) A final assessment of the caliber of the engineer through a test.

We had suggested enactment of an Engineers Bill to introduce such a system of qualitative assessment of the professional caliber. So far this assessment was done only on a quantitative basis – so many years of experience. We had suggested introduction of a professional status higher than that of the engineering degree, which only qualifies an engineer to reach the decision making level and practice the profession as a "Professional Engineer" or "Consulting Engineer". We had also proposed that in order to retain this higher status the engineer had to keep himself updated with the latest developments on a continuing basis in his field of specialization and follow ethical practices in his professional conduct. Also, this higher status can be withdrawn if an Engineer fails to fulfil the specified criteria at any stage in his professional life.

We had argued that with the introduction of such a self regulatory system, the sagging image of engineers will also get a boost.

In support of introduction of such a higher status and a system of licensing and registration of engineers, we had also pointed out that these measures were essential in the era of Globalization which we were entering at that time. WTO, GATS, Washington Accord, Mobility Forum were all in the wings.

In order to mobilize support for the proposed "Engineers Bill" we had approached the Institution of Engineers (India), Ministry of HRD, AICTE, Engineer Members of the Parliament and so on. Committees were set up, but were ineffective in putting the Bill in the pipeline for enactment by the Parliament.

It is worth mentioning that one such committee was set up in 1990 by the Institution of Engineers (India) under the chairmanship of Sh. K.C Pant, who is the patron of ECI and was a Union Minister at that time. This Committee was called the "Engineers Status Apex Committee". Terms of Reference of this committee were "To deliberate on all matters affecting the status of engineers and to ensure for them the rightful place in the Society" because "Until a few decades back, the engineer commanded high respect and position in the society, gradually, his status has been reduced from that of a leader to that of an obedient follower. He is made a scapegoat for failures of various schemes. Consequently, the image of the engineer has been tarnished". This committee had one or two meetings without any tangible results.

Finally, out of desperation, ACE (I) filed a Public Interest Litigation against the Ministry of HRD and AICTE in 1996. After a number of hearings, our petition was dismissed in the year 2000. The Ministry of HRD and AICTE had deposed that they were in favour of the Engineer's Bill but unfortunately there was no consensus in support of such a measure amongst the Engineers of the country.

Depressed but not discouraged, we continued our efforts to seek such a "Consensus" of engineering fraternity.

Finally, this consensus was arrived at when as many as twenty-four Professional Engineering Associations and Institutions got together to form the Engineering Council of India in 2002.

The terms of reference of ECI are known to you all. In pursuit of these terms ECI has started in right earnest to steer the "Engineers Bill", commence registration of Professional Engineers and Consulting Engineers, study implications of WTO/ GATS, Washington Accord, Mobility Forum and address itself to other professional issues concerning engineers

It is, however, unfortunate that at this juncture when we were making steady progress towards our cherished objective of Engineers Bill, confusion has been created by AICTE by

publishing a public notice in the media, that AICTE intends to perform the functions which ECI was mandated to perform and had already started performing.

Our Association and I, in my personal capacity, because of my long association with the cause the Engineers Bill, have made representations to AICTE and Ministry of HRD, that the task of regulating the profession of Engineers should be left in the hands of professionals themselves rather than being usurped by academicians who form AICTE. I hope both the Ministry and AICTE assess our representation objectively and let ECI go ahead in its efforts to regulate the engineering profession.

It is a pity that years ago when we were knocking at the doors of AICTE and Ministry of HRD to initiate and support the Engineers Bill, we were given a cold shoulder. But now when ECI has finalized the draft of the Engineers Bill and is on the verge of initiating the formalities of its enactment by the Parliament, AICTE is attempting to disrupt this process.

I will now briefly enumerate a few other professional issues which are of utmost concern to Consulting Engineers. If time permits, I recommend some of these issues be taken up during the ensuing panel discussion. These are:-

- Inefficient Selection Procedures (lack of transparency)
- Selection on the Basis of Price alone
- Arbitrary Reduction in Consulting Firms Overheads and Social Costs
- Low level of Consultancy Fees
- Inappropriate Requirements of Bid Bonds, Performance Bonds and Retention Money
- Serious Cash Flow Problems
- Lack of Commercial Credit Facilities
- Adverse Policies, Procedures and Attitudes of the Government
- Preference for Public Sector Firms and in-House Department Work
- Public Sector firms getting work without competition
- Lip service paid to developing local firms, but preference for foreign firms already in practice
- Multilateral financing agencies with a strong bias for foreign consultants
- Insistance of Funding Agencies that in a joint venture for funded projects a foreign consultant should be the lead consultant
- Absence of a National Stipulation that for all joint ventures, local consultant and not the foreign consultant should be the lead consultant
- Joint Venture ineffective in Transfer of Technology

Before I conclude, I will like to mention about another issue which I feel is very important for our profession.

Somewhere down the line, the profession of Engineering got tainted with the malice of corruption. Unfortunately, this taint has got stuck so firmly that it does not leave the

profession. Under the pressure of funding agencies like World Bank or Asian Development Bank, efforts to change the emphasis from public sector to private sector and allowing participation of foreign consultants in our extensive engineering activities has not helped. If anything the corruption has increased. If earlier it was restricted to the profession of engineering only, now it has spread and there is a strong nexus between politicians, bureaucrats and engineers. Many foreign engineers and consultants, who are reported to be honest in their respective countries, are also merrily indulging in this malpractice. Not only that, they accentuate its prolification under the camouflage of marketing. I feel ECI and its member associations need to address themselves to this issue of vital importance. This stigma has to be erased.

These are some of the issues facing the Engineering Profession today and any deliberation on Professionalization must address these issues fairly and squarely. Then only we can think of Professionalization of Engineers in its correct perspective.

Remarks of Participants in the Concluding Session

Participant-1. I have been the member of the Engineering Council of UK for a number of years. They have a proper code of ethics, which are valued by their members/ societies. They have got regular system of continuous professional development. They have got a system in academic, industry and research. I feel that the senior professional engineers in this country have not done enough for the development of juniors and if we have to develop and improve the professionalism in our country the main thing is to devote time on our juniors. A Chief Engineer has to devote some time on their probationary officers (atleast half an hour everyday). I think this should be started in every department where new and fresh engineers are appointed.

Participant-2. ECI seems to be growing without consulting its members, it has a list of 4 societies as members, and none of the members of the society had been consulted of what ECI is doing and what has to be done. It is their responsibility to consult their members before taking a decision. I am glad that you are locked in the bureaucratic battle with AICTE. In this you are stating you are truly the representative of the professional society. I was told that there is enough time to discuss the draft of the engineers bill. In yesterday's meeting, it was told that any one who has 15 years of experience would qualify in the list of first professional engineers. I don't know from where this number came from, I know many professional engineers who are not even competent after these many years of experience. I think there should be atleast 35 years of experience, then you would have a small body registered under the professional engineers.

Participant-3. I have a view that adequate time should be given to engineers bill. It should be given to all the participating member-organisations, who have the code of ethics. If you look at the American situation each and every association is having code of ethics. ECI should make

it mandatory to have code of ethics, it should be duly discussed and the concept of professionalism should be there among the engineers.

Participant-4. Lot is being talked about the WTO, GATS and other things for regulation, manufacturing, importing and exporting of goods from one country to another or technology from one to the other. ECI has been rightly taken the step of joining EMF. It will increase the number of immigration checks, cut in the number of issuance of visas and will not allow to move the professionals freely. It will be much easier for a professional to work through Internet to give services, make short-term business trips and avoid staying abroad for a long time.

Participant-5. Need of the day is that engineering profession is recognised and regulated. We should be accountable that is why the engineers bill is absolutely necessary, it is not that one has to go to UK or USA and even for working within the country, we need to be recognised. After getting the education and serving the profession for 5-10 years we should be professionalised. I do not agree that I should be professionalised after a service of 35 years, I do not know whether we would be able to serve the purpose of professionalism properly after being professionalised in that age group.

I also heard someone stating that ECI is not consulting the member associations and is not listening to them, ECI cannot go to all the 24 societies or whatever, it is the right of the member associations to participate in the decision being taken by ECI.

Participant-6. There are two comments, which I want to make:

Talking of professional engineering, I would say that in the education itself there is a lot of disparity in the country.

I think the faculty, which is teaching, or training the engineers should also be trained on a regular basis, as these faculty members do not have any field experience although they are very well qualified.

6.4 R.V. Shahi

Before concluding the session, I would say that quality, efficiency and accountability are the main issues, which the engineering profession should be more concerned about. ECI should organise short-term programmes to safeguard the proliferation of the engineering institutions and to avoid the quality of such institutions.

Performance audit should prevail upon the procedural audit. Respect to other engineering fields and to other professions should be given and carried out in the development process.

For enhancing the image of the engineering, ECI should include long and medium term courses. Bridging the gap between the education and research institution should be done and organisation of seminars and training should also be done and taken up seriously.

6.5 Concluding Remarks: Prof. Ashoka Chandra

We have come to the end of a very fruitful one and a half days. During various sessions large number of important points have been made and it will be our endeavour to see that these points are duly reflected upon, their significance is internalised and that ECI culls out from that issue in which it needs to work further. I am quite sure in that process we will organise a series of conferences, workshops to reflect on this specific issue which are relevant to engineering profession.

You have contributed by your presence and your inputs and we hope the kind of support that you have extended to us in the first conference, will also be available to the ECI in future. I would begin with the last comment which Mr. Mahendra Raj made about the taint on the engineering profession. While in such things certain amount of truth is there. We need not be overly pessimistic about the engineering profession. I think as he also observed, we tend to be over critical of ourselves. I think corruption and other things are problems but these are not impossible problems these are problems which have got solutions. I think we need to create confidence among engineering profession. These can be solved if we make efforts this can be removed from our system. If we create sense of helplessness about them I think there is a need of making serious efforts would be seriously compromised.

Reference was made to the engineering manpower, I want to mention it is true that there has been fast expansion of supply of engineering through education institutions and quite rightly all of them are not of good standards. If we recognise that the technical capability is at the centre of economic development and that technical capability in professional people than the size of professional would be crucial for economic development of the country. I immediately concede that this number should be quality and not just quantity. For 1000 persons in a population US has 55 Scientists and Engineers, Japan has 110, Germany has 86, UK has 64, Brazil has 25.9, South Korea has 45.9, China has 8.1 and India has 3.5. When we are to compete internationally, we need quality and quantity manpower. Comparing 3.5 with others

clearly we need to expand the availability of professional manpower but there has to be quality manpower. That is the whole purpose why ECI felt that we need to make sure that not only education qualification are of international level but our accreditation system and process will be accepted by international community. Professional practice has also to be accredited this is what ECI is all about. We have to make sure the persons who will be recognised as professional can meet the international accepted standards of international practice and nothing less and all these efforts in my view will be done through professional societies because they are the custodian of the professional in their areas and they have to ensure that the professionals they put up for recognition as professional engineers are of quality that can be easily accepted internationally. Professional societies have a great deal of efforts to do. A framework has been worked out and professional societies who have been involved to develop that. They have adopted the framework and I am now looking forward to the recommendations of different professional societies about who should be accorded with the status of professional engineer, we hope that it would happen. Let me also say that we are at a very difficult point where we can, in our urge to build numbers into lakhs, compromise our standards but in the long run it will back fire, so it is very important for the professional societies to be hardnosed about the quality of person while recommending the names of persons being awarded the status of professional engineer because this initial setup is going to set standards which will be emulated and valued in the times to come if we goof up in the beginning then it will be very difficult and ECI will be lost.

You are aware in the coming of WTO/GATS, there will be opportunities in the service sector and doors will be open for service providers from outside. They will be in a position to bid for and access in India. We, on the other hand, will not be able to access these opportunities unless we are not recognised internationally that is the reason that both EMF and Washington Accord become crucial. We have to join the EMF and India has to become the member of EMF. In a sense we have lost sometime in the past and now as the professional societies have come up together we are now well on our way to achieve the provisional membership of EMF. First we have to get provisional membership and then we would become a member in due course of time. Actions are already in the process of succeeding.

I think an important point was made regarding the profession which was not given higher status. There is absolutely no question in my mind that sooner or later this country will recognise the centrality of profession to the task of development and accord them status and role.

In this regard some one has to space an idea, another has to push it to change the mind set of the people and start pushing the boundaries further and further. This is the task which all professional societies and ECI have in their hands. This is not going to be easy because those who are interested in a position of authority will not give it up easily. It is not a process which will come to end through conflict, it will be through enlightenment and proving that this role is to happen. I think ECI and others are working on this.

Let me finish by stating that we have started the first leg of the long journey, there will be ups and downs in this. There will be problems to which reference was made, but if we keep our cool and if we don't get upset in minor problems, I think in the end logic will prevail. May be after 5 years, we would have a much stronger engineering profession in the country.

6.6 Closing the Session: Dr. Uddesh Kolhi:

We have come to the conclusion of the conference. I thank the delegates and participants of the conference who are here and who have contributed for the success of the conference. I thank the all the session Chairmen, Speakers, research persons who have made excellent presentations and conducted various sessions and sponsors who have made it possible. I thank the team not only the ECI but also the CDC, CIDC, India Habitat Centre and all the member organisations and of course IE (I), who have worked day and night. I also thank the media which was present here and every one who was directly or indirectly engaged.

Many things were mentioned about the consultation process and other things. I would like to mention that it is not only the member organisations but also others, who have given comment on many issues relating to the registration process. Every draft of the registration process and committee reports are placed on the website of Engineering Council of India and every individual has the right to send the comment on the reports.

With this, we now come to the end of the conference, let me thank everyone once again.