"Our structures have to be durable and long-lasting"

ICJ: **What, in your opinion, are the major achievements in concrete construction field during the past few decades?**

CSV: In the past two decades, phenomenal developments have taken place in concrete construction in India. There has been an awareness amongst the construction fraternity that our structures have to be durable and long lasting. Several developments abroad and innovations within the country have helped in realizing this. The foremost are:

- Development of better quality and better performing cements
- Popularisation of construction chemicals, in particular, superplasticisers and hyperplasticiser
- Improvements in formwork assembly and popularisation of special types of formwork systems
- Advent of better devices for mixing and placement of concrete; and popularisation of ready mixed concrete
- Importance given for construction and quality management
- Stricter provisions in National Standards and other technical documents to ensure quality construction.

ICJ: **How do you see the construction scenario changing over the next few decades?**

CSV: Significant changes can be visualised, over the next few decades due to facts that:

- several global leaders in construction are working on Indian projects, bringing in the best and latest in the field of construction
- vast experience is gained by leading Indian construction groups while working abroad
- significant experience is gained by the Indian professionals around the world

Dr C.S. Viswanatha graduated in civil engineering with distinction from Mysore University in 1960 and thereafter obtained master's and doctorate degree in structural engineering from Indian Institute of Science, Bangalore. He was a member of faculty at Indian Institution of Science, Bangalore during 1963-1980. He subsequently joined Torsteel Research Foundation and is presently its chief consulting engineer, heading south zone at Bangalore (India). His fields of specialisation include concrete technology, concrete and steel structures, hydraulic structures, precast construction and renovation/rehabilitation of structures. Dr Viswanatha has published about 75 technical papers in national and international journals. He has edited Torsteel Technical Bulletin during 1981-93 and has co-authored Torsteel Design Handbook in 1988. In 1997, he was honoured by Institution of Engineers, Karnataka Centre for "professional excellence in civil engineering" and had been awarded 'ACCE Gaurav award - 2000' by Association of Consulting Civil Engineers (ACCE) for significant contribution to "Civil engineering consultancy". He was cited as "Man of the year - 2000" by American Biographical Institute. He has been the president of the ACCE (1988-1990) and vice-president (south) of Indian Concrete Institute (ICI). He went on to become the president of the ICI during October 1999 to October 2001. Dr Viswanatha is currently active in the area of structural designs of special structures, proof checking of structural designs, advisory services to structural engineers, testing of structures, rehabilitation of structures and quality auditing of constructions.

- importance of fast-track construction has been fully realised
- better materials like multi-blended cements, stainless and FRP bars, hyper plasticisers, silica fume, etc. are becoming popular; and that
- there is a growing necessity for mass quality construction at economical prices.

In particular, the realisation of importance of fast-track constructions and improvised expertise of the Indian construction industry is bound to change the construction scenario.

It is a competitive world and hence the Indian construction groups will do their best to survive and to get recognition around the world.

ICJ: **Improving durability of structures is a growing concern amongst the engineering fraternity. How best can we tackle this problem?**

CSV: Durability of structures can be improved through the two domains, which are, the design domain and the construction domain.

The basic concepts of high performance concrete and high performance construction are to be introduced right at the stage of structural designs and structural details. Durability improvement parameters are to be given the prime place.

The quality and grading of aggregates, quality of mixing water, high performance cements, restricted water-cement ratio, appropriate cover provisions and structural designs based on durability criteria (which essentially take cognizance of exposure conditions), are some of the durability parameters to be attended to. In addition, appropriate construction discipline is a must.

ICJ: **What are the major recent trends in the use of steel as reinforcement in RC structures?**

CSV: In the past, we have come through plain mild steel and cold twisted high strength deformed bars. Major changes are now seen in this terrain. In place of cold twisted deformed bars, thermo-mechanically treated bars are getting in. Further, the main Indian producers have brought into market corrosion resistant rebars. Parallely, galvanised rebars and coated rebars have also gained ground.

Fast-track constructions and improvised expertise of the Indian construction industry is bound to change the construction scenario

However, around the world, preference is given for stainless steel and FRP rebars. Glass, aramid and carbon fibre rebars have been tried out. Since the civil engineers are concerned with corrosion of rebars, it is likely that stainless and FRP rebars will emerge as the popular ones.

In the area of rebar accessories, the trend around the world has been to use of spring clips, quality cover blocks, efficient mechanical splices, rebar meshes and computer aided fabricating units. Days are not far off, for these to emerge in India.

ICJ: **There is a feeling amongst a section of the construction industry that HYSD bars are more prone to corrosion than mild steel. What is your opinion?**

CSV: The basic chemical composition of mild steel and high strength deformed bars is the same, except in case of metallurgical and special steels. However, certain variations are significant while comparing the two such as:

- high strength deformed bars are subjected to higher levels of stresses during the service life of structures, in comparison to mild steel. In essence, high strength deformed bars are highly stressed bars during service
- there are thin lugs and ribs on the surface of high strength deformed bars, wherein often there is stress concentration during service
- residual stresses do exist in the lugs and ribs of high strength deformed bars, and there are inherited during manufacture. The degree of residual stresses depends on whether the bars are cold twisted or thermo-mechanically treated
- sometimes, carbon content may be slightly higher in case of high strength deformed bars compared with mild steel bars

These, to some extent, are responsible for higher proneness to corrosion of rebars. But, the fact remains that proneness to corrosion of any rebar depends primarily on the quality of construction, in particular, the quality of cover concrete.

ICJ: **The awareness about non-destructive testing has improved during the recent past. How best can this technique be used as a QC tool during actual construction?**

CSV: It is true that the awareness about non-destructive testing has improved. This is evident in many of special and large scale constructions around the country.

Some of the potential devices in the non-destructive category are:

(i) ultrasonic and impact echo testing

(ii) cover meters and profometers

(iii) endoscopy devices

(iv) permeability test set ups

(v) adhesion and break-off test devices

(vi) potential difference and resistivity testers and

(vii) carbonation and chloride detection devices

Obviously, the first four are meant for quality control in new construction and the subsequent three are meant for evaluation of existing structures. There is no two opinion about the importance of these devices in ensuring quality in constructions. It is time that these tools are given the prime place in construction standards, tender documents and quality manuals.

ICJ: **You had been the President of ACCE and ICI and have immensely contributed to the growth of professional bodies in the country. In your opinion, how can the effectiveness of the professional bodies be improved?**

CSV: Any professional body can be effective only when it responds to the needs of the corresponding professional community. In this context, one can always cite the American Concrete Institute (ACI) as a role model. Its sincere efforts are noteworthy in:

- promoting fellowship,
- dissemination of knowledge through seminars/symposia/workshops
- bringing out publications of the highest standards
- establishing itself has a global body and not as a local body, and
- attending to the genuine grievances of the professional community in the society.

"My philosophy has always been to ensure ethical standards in whatever we do"

The professionals treat it as an honour to get affiliated to that institute.

On similar lines, ACCE and ICI are striving their best to reach out to all the Indian professionals, in order to be effective but may be not to the extent of the ACI. I am optimistic that in days to come the Indian professionals will also treat it as an honour to get affiliated to these institutions.

ICJ: **A little personalised question, you started your illustrious career as an academician and have had a meteoric rise since then as one of the leading consulting engineers in the country. What do you attribute your success to?**

CSV: It is true that my first stint of seventeen years was in the Indian Institute of Science, Bangalore. Teaching and research were the main concerns. Subsequently, in the past twenty three years, I have been engrossed in civil engineering consultancies in Torsteel Foundation.

My first stint did give me a strong base of my career. Teaching and research activities rendered my engineering basics strong enough, which has been of immense help to me, right through, in the consultancy field.

I knew that, to realise success in any consultancy project, it has to be team work by a competent dedicated group. I also knew that one can do justice in the field of consultancy, only if he is fully equipped with supporting library and laboratories. Keeping this in mind, in Torsteel Foundation, I concentrated all these years in developing full fledged library and laboratories; and a team of potential, hard working team of engineers.

In addition to the above, my philosophy has always been to ensure ethical standards in whatever we do. Although this is not easy enough, my team and I have been doing out best towards this.

If you feel that my career is illustrious and had a good rise, it is essentially due to the:

- strong base that I could get as an academician in the beginning,
- support I could get from full fledged library and laboratory facilities,
- effective teamwork of my team in the consultancy field; and
- efforts in upholding higher ethical standards.

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