

Chapter 6

Literary Pursuits

From Germany, I had brought in 1965 a lot of books, periodicals and hand-written notes on some topics of structural engineering like shells, folded plates, precast and prestressed concrete and design of staircase of various types. This material was not easily available in India then. I was studying it even during office time as the work in the office of M/s Chowdhury and Gulzar Singh was then on the low ebb temporarily. I prepared a paper on the analysis of framed and shear walled buildings and sent it to the Indian Concrete Journal (ICJ) for publication. After sometime I got a reply that the paper could not be published in the journal as there was a huge pressure on their space. Later, I came to know that that was their standard reply. They would not comment on the deficiencies of the paper. I was highly disappointed. Later, I realised that the paper was quite long and multi-pointed. Anyway, I kept that work on the side and started working on design of reinforced concrete columns. We used to design columns by Reynold's Handbook (1956 Ed.), Handbook of Concrete Association of India (CAI), and Handbook of American Institute (ACI). These three methods led to three different results in a given example. I delved deep into the subject in order to understand the reasons for these variations. Another method was given in the book of Applications of Moment Distribution published by CAI, which was called equivalent axial load method of design. It was based on ACI code. It was a very elegant method of design applicable to columns under uniaxial as well as biaxial bending. I changed the ACI method to our Indian code IS:456 and prepared a paper and sent it to the ICJ. Luckily, it was accepted for publication and it came out in December 1967. What a joy I felt then! It was my first published paper. The paper was well received and it was used in design offices for some period. Soon Handbooks based on the working stress design and ultimate strength design were published by the Structural Engineering Research Centre (SERC), Roorkee and these supplied convenient charts based on IS Code for design of columns under uniaxial bending. Biaxial bending of columns still remained a problem. It was my experience that if one delved deeply into a problem, it would bring out a lot of ideas. On column design, I wrote three other papers, including one on biaxial bending of columns. Some of these papers, I wrote together with my engineer friend, Mr. P.L. Assudani, who was then in CPWD, Calcutta. We made a good partnership.

Later, I revived my first discarded paper on frames and shear walls and with the help of Mr. Assudani, we brought out two separate papers, one on framed buildings and the other on shearwalled buildings. These papers were published in 1968 and 1969. The paper on shear walls got a mention in the reference columns of the journal, ACI. After 1968, there was a lull in my literary activities. I had lost my job of ten years standing and I was busy with the nitty-gritty of life. Work in the offices of M/s Kothari and Associates and NIDC was quite hectic. In NIDC, I worked on the design of folded plates. In my research at IIT, Delhi, I had attended lectures of Prof K. Seetharamlu on folded plates. From Germany, I had brought a lot of literature on folded plates. When I went to Libya in 1974, my mind was full of ideas on folded plates. There was a lot of time available to me in Libya. I wanted to make ready-made tables for design of folded plates, if not for final analysis but at least for primary analysis. I took up a case of five-plate northlight folded plate. Using Simpson Method, taught by Prof. Seetharamulu, I succeeded in deriving formulae not only for primary analysis but also for secondary analysis. That way, the ready made tables could be made for northlight folded plates for certain range of suitable parameters. I

was solving some problems given in the literature by using a slide rule. Later in Libya, I bought my first calculator in life. What a joy it gave me then! Slowly, I solved many examples and verified the correctness of the formulae derived by me. I then made a paper and sent it to ICJ. Unfortunately, it was rejected. Perhaps, it was too long for the journal! Next, I worked on the V-shaped folded plates. I derived the formulae on the basis of Simpson Method and with the help of my Casio calculator I prepared design tables for a certain range of parameters. I prepared this paper and sent it to the journal of ACI, USA. It was rejected, but they gave reasons for rejection. They mentioned that in USA folded plates were then being designed by suitable computer programs which were based on the method of elasticity and not on an approximate method like that of Simpson. I understood and appreciated their objections but I still felt that those tables for analysis of folded plates would be useful for Indian engineers and also for other engineers the world over, because computer programs were not within the reach of every engineer, while those tables, when published, would be easily available to all interested engineers.

Similarly, formulae for other shapes of folded plates like trapezoidal shape, trough-shaped, symmetrical and unsymmetrical shapes were developed by me. For each shape, I solved one example on my calculator and compared the results to those given in the published literature. For deriving tables, I had to calculate each case separately over the calculator. It was a very long task for me. Then entered my friend, Mr. K.N. Taneja into this subject. I shared my problems with him. He possessed a good knowledge of folded plates and had designed some folded plate structures in practice. He suggested that his brother in India could produce programs for us on the basis of our formulae for each shape and the computer would give then design tables for a large range of parameters. It was done and with the kind assistance of Mr. V.B. Taneja, a large number of tables became available to us. We selected the useful range of parameters and prepared a book 'Design Tables for Folded Plates' which was published in India in 1982. In the book, we added two full scale examples of folded plate structures. Also, a chapter on the design of reinforcements in folded plates and the supporting traverses was added. It was a complete sort of a book. We had completed the book in 1978 but our publishers in India took more than four years to bring it out. The delay in publishing the book was often a matter of despair to us. But on publication of our first book in life, our joy was unbounded. We received from the publishers ten free copies which we distributed to our friends in Libya, who had been very helpful to us during the preparation of the book. We then had a plan to work on the second volume of the book in order to extend these tables to the design of continuous folded plates. However, due to the delay in publication of the book, we could not make much progress on the proposed second volume and the work was left incomplete. Later, in India I published a paper on analysis of continuous folded plates in ICJ September 1991. This paper was also noticed and mentioned in some international journals. This sums up my work on the analysis of

simply supported and continuous folded plates of different shapes.

Then I turned my attention to reinforced concrete design based on IS:456-1964. SERC's Handbook on ultimate strength design method was with me. I was working on the derivation of the charts for design of columns under uniaxial bending. I found some interesting discrepancies with available charts. Then I came to know in Libya that IS code had been revised and the new code IS:456-1978 had come out in the market in 1980 along with an IS Handbook called Design Aids. I obtained both these publications from India and started working on the new code.

During my ten year stay in Libya, I published seven papers in Indian journals, two of these papers being in partnership with Mr. A. Radhaji and Mr. R. Subramanian. A paper on the spacing of expansion joints in building was much appreciated. It also gave a method of including the effect of temperature into structural design of buildings. This aspect had remained obscure in the existing literature. Also I wrote three papers on the deflection of reinforced concrete slabs and beams in the light of the new code (IS:456-1978). Further, two papers were written on the design of rectangular and non-rectangular beams. A paper on the biaxial bending of beams was published in 1982. It gave design aids which were then not available elsewhere. My second book 'Manual for Limit State Design in Reinforced Concrete Members' was published in 1984. This was a useful book for design engineers for their day-to-day office work. I put in this book many useful design aids developed by me for my personal use. The book covered slabs, beams, columns under uniaxial and biaxial bending, isolated footings, cantilever retaining walls, liquid retaining structures, expansion joints, solid and hollow circular columns and slender columns. I needed help from my colleagues which was provided by Mr. A. Radhaji as my co-author. Mr. Kuldip Singh, my young engineer-friend gave me great help in preparing sketches and charts.

Technical books did not bring us much royalty. We received royalty for initial two years only that too of about Rs. 1,500/- a year for each author. It was actually peanuts. For the third year, the publishers said that the sale of books was not much, so no royalty was paid to us. Our first book on folded plates is still alive and it is available from the publishers. Our second book sold well but soon it went out of print. Though in demand, the publisher could bring out its second edition only in 2001. I added seven new chapters to the book and it is now much in demand by the engineering community.

On return to India in 1984 till my retirement in 2003, I wrote another 27 papers on various topics.

On foundations, I have written two papers, one on pile foundations and the other on footings for columns on the property edge. Deflection of two way slab panels and flat slabs formed the subject of two papers. Biaxial bending of rectangular and triangular column sections was given in four papers. A major overhead tank resting on a circular thin shaft failed suddenly in Noida. It provoked me to prepare an incisive paper on the design of such structures. I pointed out pitfalls in the code and the existing textbooks written by leading academicians and brought out the cause of failure of thin shafts to be local buckling. I wrote papers on items like computer versus structural engineer, role of checking engineers, on how to reduce steel consumption in buildings, etc. Some of these papers were written in partnership with Mr. Rajan Abrol and Mr. P.C. Nirala.

In 1994, when I attained the age of 58 years, I decided to stop designing structures myself and restrict myself only to checking the work of my young engineers in the office. I had time on my hands and I then decided to write a third book of my career as an author. It was on the design of multi-storeyed buildings, a topic in which I have been working all along the years. I finished the manuscript on 18th November 1994, but the book came out on 26th June 1999. Again, it took my publisher (a different one this time) more than four years. It was a frustrating experience. The book was well received in the market. We brought out its second edition in 2002 with an addition of two more chapters and some more useful tables in its Appendix II. On 28th September 2002, my fourth book on 'Biaxial Bending of Reinforced Concrete Members' came out of the press. I had earlier published seven papers on biaxial

bending of columns of various sections. These papers have been brought together along with some other useful material to make the fourth book. I have spent my life time on this difficult topic of biaxial bending of reinforced concrete sections and it gave me a great satisfaction to publish this book.

I have written in all forty papers spread over my entire career of forty five years, all on the design of structures. The subject-wise distribution of papers is as follows:

Columns 6

Deflection 8

Beams 2

Foundations 2

Folded plates 1

Multi-storeyed buildings 14

Biaxial bending 7

It takes about one and half year to publish a paper. I have got published four books.

Two of the books took 4½ years each to get published and the other two took about a year each. Two of my books got their second editions also. Literary writings have kept me active and alert in my entire professional life of forty five years.

