Preface

The last three or four decades saw a systematic growth of organized research efforts in understanding the behavior of concrete produced by dispersing short steel fibers at the time of mixing. These efforts led to the development of numerous material models and analysis methods to capture the response of the steel fiber reinforced concrete (SFRC). Concrete is a quasi-brittle material and it possesses a low tensile strain capacity. However, the inclusion of the steel fibers in the mix at the time of the concrete production significantly improves the brittle characteristics of the concrete; it starts exhibiting a better performance not only under static and quasi-statically applied loads, but also under fatigue, shock, and impulsive loadings. Nevertheless, this improvement depends heavily on the pouring methods and the procedure used in the SFRC placement and its compaction in the molds.

The recent developments in the control methods and techniques to assess the amount and orientation of the steel fibers in the hardened concrete have given a big boost to the use of the SFRC, confidently, in various engineering applications, such as the elevated slabs, the ground supported slabs, the beams, etc. The improved post-cracking characteristic of the concrete caused by the steel fibers enables the designers to rely on the tension capacity of the SFRC alone. If properly designed, one of the greatest benefits to be gained by using SFRC is improved long-term serviceability of the structure. Serviceability is the ability of the structure or part thereof to maintain its strength and integrity and to provide its designed function over its intended service life. This monograph presents a forward analysis method to proportion the concrete sections reinforced by means of the steel fibers as well as the conventional longitudinal reinforcing bars in the section tension zone, unlike the previous models that seek input from the standard experimental investigations or some empirical expressions as a prerequisite to formulate the material constitutive model. The fiber parameters, such as fiber volume fraction and its aspect ratio along with the concrete compressive strength can be determined easily to attain a desired material response and the strength in its hardened state.

This monograph is a modest attempt to explore the world of concrete, especially SFRC as it applies to the analysis and design of structural members. It attempts to
summarize the vast amount of the research information related to the SFRC becoming available these days at one place. I hope it will prove useful to the consulting engineers who want to use the SFRC in routine design assignments as the generic model and the design charts presented here would help them to quickly proportion the members, decongest the regions of the maximum moments by making use of the steel reinforcing bars and the steel fibers to resist the load in unison. It will also be helpful to the academician and the researchers who want to understand the SFRC better and explore it further. For the convenience of the readers, the notation/symbols are given and explained at the point of their use in the text.

Before concluding the preface, I would like to express my sincere appreciation and thanks to all those who are working continuously across the globe to explore this material for the betterment of the humanity. The author also acknowledges his debt to various agencies, particularly the RELIM, CNR-DT and different sources on the Internet, for their published material and various images/photos, respectively to which references are made in the monograph for the benefit of the readers. The author also expresses his gratitude to University Grants Commission, New Delhi, who contributed in making this monograph possible. The support and help provided by Nina Concrete Systems and MRH Associates are greatly appreciated and acknowledged. At the end, the author would like to express his heartiest appreciation for all those at Guru Nanak Dev Engineering College, Ludhiana, who rendered help and support in this work.

Ludhiana, India

Harvinder Singh
Steel Fiber Reinforced Concrete Behavior, Modelling and Design
Singh, H.
2017, XI, 172 p. 56 illus., Hardcover
ISBN: 978-981-10-2506-8