ABSTRACT

An exact analysis of shear strength in reinforced concrete beam is quite complex. Several experimental and analytical studies have been conducted to understand the various modes of failure that could occur due to shear, bending or possible combination of shear and bending moment acting at different sections. The literature review indicates that there is limited understanding and lack of transparency in existing information on steel fiber reinforced concrete as a structural material. Similarly, use of fibers as shear strengthening is limited by design guidelines of various codes for shear applications.

The present research seeks to address the shortcomings by using theoretical, experimental and numerical methods that allows for the complete characterization of the shear response to failure. The dependence of shear strength on number of parameters and non-availability of specific method of experimentations to understand fibre-matrix interaction requires to apply advanced computational techniques like artificial neural networks.

The main objective of present investigation is to study the effectiveness of steel fibers in reinforced concrete deep beams in shear without stirrups and develop a generalized equation which will include major influencing factors to predict the ultimate shear strength of SFRC deep beams in shear besides the complexity involved therein. The exact analysis of shear strength in steel fiber reinforced concrete deep beam in shear involves complexity due to intricate behaviour of this composite member. It involves number of parameters affecting ultimate shear strength as well as their inter dependency nature. To achieve the objectives irrespective of number of parameters, the experimental work was conducted for testing the beams satisfying the deep beam criteria mentioned in code of practices like IS456 -2000 and ACI 318-2008. A concrete mix grade M25 and M50 were designed using the properties obtained by testing the ingredient materials as per IS code provisions. An equation is proposed which takes into consideration the effect of fiber orientation and validated with results of experiments, ANN and equations suggested by some of previous researchers.

To overcome the exhaustive experimental work and study combined effect of fibers, concrete and longitudinal steel for wide range of parameters, an artificial neural
network technique has been applied using computational software MATLAB 7.8.0 R2009a. The data base required to develop the neural network is obtained from the results of experimental work of previous researchers as mentioned in published literature. The results of developed neural network are validated by another experimental work on concrete grade M50 SFRC deep beams of three different cross sections and shear span to depth ratios.