Self-Compacting Concrete (SCC) is an engineered concrete, made to flow by its self-weight, without bleeding or segregation of concrete. It is superior to Normally Vibrated Concrete (NVC) in many respects. Being a pumpable concrete, it can be pumped to hundreds of metres, making it more suitable for high-rise building construction. In addition, it is capable of providing for better and high-quality smooth surface finish. In this research, in order to evaluate the performance of hybrid fibre reinforced Self-Compacting concrete, as the first step, M30 grade of SCC with the prescribed passing ability, filling ability and segregation resistance was achieved as per EFNARC guidelines.

Use of waste materials as replacements for cement not only enhances its mechanical properties, but also adds to its sustainability. This alleviates environmental pollution and results in substantial reduction in the cost of construction. Materials which possess pozzolanic properties increase the powder content of SCC, aiding in self-compactability, flowability and workability. By the experimental study, the optimal dosages of fly ash and silica fume arrived at was 10% and 5% respectively.
Brittle characteristics of SCC can be overcome by incorporating discrete fibres, forming Fibre Reinforced SCC (FRSCC). The fibres used in this research include hooked end steel, polypropylene (PP), AR glass, carbon, recron 3s and human hair fibres. FRSCC, with different fibres at constant variation of fibre by volume fraction, was analyzed and glass was chosen for further analysis. Upon extensive literature survey, certain fibres, at certain range of volume fractions, were found to perform well. For steel fibre, 0.5% to 2.0%, for PP 0.1% to 0.6% and for glass fibre, 0.3% to 0.5% was the ranges identified to have exhibited better performance.

Hence, it was decided to employ steel fibre, PP fibre and glass fibre for hybridization. Two fibre cocktails were made with those fibres, termed as Steel-Polypropylene Hybrid SCC (SP-HFRSCC) and Steel-Glass Hybrid SCC (SG-HFRSCC). SG-HFRSCC performed better in compression and tension, whereas SP-HFRSCC performed better in flexure. The synergic effect of these HFRSCC mixes improved the mechanical properties like ductility, toughness and energy absorption over those of FRSCC.

Behaviour of exterior Beam-Column joints was analyzed with HFRSCC mixes. The mixes were found to flow freely into the reinforcement. In the beam-column joint with ductile detailing and with hybrid fibre incorporation in SCC, the maximum deflection observed was less compared to those without fibres and/or without ductile detailing. This was due to
enhanced energy dissipation. The load taken by SG-HFRSCC was observed to be the maximum and it had a greater stiffness value. Hence, it could be recommended in framed structures, wherein it would provide increased stiffness, thereby proving to be potentially suitable for seismic construction scenarios.

Researchers have so far carried out various experiments on SCC without fibres, with mono fibres as well as with hybrid fibres. This research work gains significance in the light of the fact that it involves the evaluation of the behaviour of SCC with the incorporation of hybrid fibres on one of the critical structural elements, namely beam-column joint, which is a novel work. It is a unique study since earlier researches have added fibres only in the joint region alone, whereas this present work has focused on incorporating fibres in the entire framework.