CONCLUSION

This study reports the experimental results of the strength properties of SFRC for M50 & M60 grade namely, Compressive strength, Split tensile strength, Flexural strength, Shear strength, Bond strength, Modulus of Elasticity, Poisson’s ratio and Modulus of Rigidity. The crimped steel fibers are used having 50 aspect ratio with volume fractions from 0 to 5%.

An empirical relationship has been developed for various strength properties based on the regression analysis.

The major conclusions and future scope of the investigation are as follows:

1. Area under the curve indicates the toughness of the concrete per unit volume. Toughness for M60 grade of concrete was noticed to be higher than M50 grade of concrete with the increase in fiber content.
2. Workability of the concrete reduces drastically in both the grades with the increase in fiber content.
3. Inclusion of steel fibers provides increase in strain while high strength concrete M60 reaches its peak stress at a compressive strain higher than M50 grade.
4. The maximum compressive strength, achieved are 18.80% & 17.09% for 28 days & 07 days respectively for M50 grade at 2% steel fiber volume fractions. While 15.29% and 29.55 for 28 days & 07 days at 2% steel fiber content for M60 grade respectively.
5. The maximum flexural strength achieved are 40.72% & 49.04% for M50 grade at 2% steel fiber content. While for M60 grade 25.65% & 29.51% for 28 days & 07 days at 1.5% & 2% fiber content respectively.
6. The maximum split tensile strength achieved are 22.66% & 18.61% at 2.5% fiber content for M50 grade. While 7.36% & 25.76% at 2.5% and 2% steel fiber content for M60 grade of concrete.
7. The results of the pullout test indicate improved concrete - steel bond, which has been achieved 8.95% & 4.11% for 28 & 7 days at 2.5% steel fiber content for M50 grade with respect to normal mix. While 4.24% & 1.89% at 2% steel fiber content for 28 days & 7 days respectively for M60 grade. This indicates that bond strength reduces with the increase in grade of the concrete.

8. The results of shear strength indicate that, there is increase in shear strength with the increase in the grade of the concrete at 2% steel fiber content. The M60 grade of concrete gives 30.58% & 44.92% increase in its strength for 28 days & 7 days with respect to normal mix. While there is increase by 7.27% and 32.68% for 28 days & 7 days at 2% fiber content in-case of M50 grade of concrete.

9. Elastic constants of SFRC are obtained by NDT methods. Empirical expressions for modulus of Elasticity i.e. static and dynamic have been developed in term of fiber volume fraction and cube compressive strength of SFRC.

10. Empirical Expressions have been established to predict the values of flexural strength for SFRC in-terms of compressive strength.

11. While testing plain cement concrete cube spalling of concrete is observed. However, it is not observed in SFRC cubes due to randomly distributed fibers.

12. The width of cracks is ranges between 0.7 to 1.5 mm for M50 grade and 0.35 to 1.4 mm for M60 grade at 28 days. Which shows the increase in ductility with the increase in grade of concrete.

13. The results obtained experimentally are in excellent agreement with those of mathematical analysis.

14. Dynamic modulus of elasticity in found to be higher than the static modulus of elasticity.

15. In all fiber content mode of failure was changed from brittle to ductile failure when subjected to compression and bending.

16. Poisons ration varies between 0.18 to 0.22 at 28 days for M50 grade and 0.098 to 0.113 at 28 days for M60 grade of concrete. Which shows the values are in good agreement with IS values.

17. Optimum fiber content for all strength is observed to be almost 2% steel fiber content.
18. The Theoretical Poisson’s ratio is three times more than experimental Poisson’s ratio (i.e. $\mu_{\text{Expt}} = \frac{1}{3} \mu_{\text{Theo}}$).

5.2 Ideal Combination

From the entire experimental work it is concluded that the mix $M_5$ (2% $V_f$) is best combination for compressive and flexural strength for M50 grade.

While mix $M_4$ (1.5% $V_f$) is best combination for M60 grade. The mix $M_6$ (2.5% $V_f$) is best for split tensile strength and bond strength for M50 grade and mix $M_5$ (2% $V_f$) is best for M60 grade. The mix $M_5$ (2% $V_f$) is best combination for shear strength for both grades.

5.3 Scope for Future Work

The present work has good scope for future research. Some of the research areas are as follows:

1. Behaviour under temperature effect for same fiber content.
2. Behaviour under freeze and thaw effect.
3. Same parameters with recycled aggregates.
4. Behaviour under creep and shrinkage.
5. Fracture analysis.
6. Stress transfer mechanism.
7. Study of impact resistant, abrasion resistant and permeability of SFRC and resistant to chemical attach.

5.4 Applications

Steel Fiber Reinforced Concrete is being used widely nowadays. SFRC has found number of applications, some of which are listed below

- Construction of runway slabs, highway paving and industrial floors.
- Impact resistant encasement of turbines.
- Repairs and new construction on major dams and other hydraulic structures to provide resistance to cavitations and severe erosion.
- Repairs and rehabilitation of marine structures & Construction of Tunnel.