ABSTRACT

The present trend in concrete technology is towards increasing the strength and application of concrete to meet the demands of the sustainable construction at lower cost. These factors can be achieved by adding fly ash, a pozzolan and natural or synthetic fibre to concrete. Over the past decades, there has been a significant increase in the use of fly ash and fibre in concrete for strengthening of existing concrete structures. In view of the global sustainable developments addition of fly ash to concrete enhances its strength and durability. It is to be noted here that fibres like steel, glass, carbon, polypropylene and aramid, provide improvements in tensile strength, fatigue characteristics, durability, shrinkage characteristics, impact, erosion and cavitation resistance and serviceability of concrete. Fibres impart energy absorption, toughness and impact resistance properties to concrete and these characteristics in turn improve the fracture and fatigue properties of fibre reinforced concrete. Glass fiber is a recent introduction in the field of concrete technology. In the case of Glass Fibre Reinforced Concrete (GFRC), strength of the concrete is increased.

In the present study, fly ash and glass fibre were added to the concrete to investigate the increase in the strength as compared to the conventional concrete. The strength parameters such as compressive strength and tensile strength were studied by varying the percentages of fibre from 0.5 to 1.5 by volume of concrete with a fixed fly ash percentage of 25. Research in glass fibre reinforced concrete resulted in the development of alkali resistance fibres with high dispersion ratio that improved long term durability. This system was named alkali resistance glass fibre reinforced concrete. In the present experimental investigation the alkali resistance glass fibre along with fly ash were used in the preparation of concrete to evaluate the basic properties such as compressive, split tensile and flexural strength of M25 grade of concrete. Along with these, fly ash and glass fibre concrete were also applied to structure in the form of reinforced concrete beams to have their better understanding.

Glass fibres of 45 mm length were added in the concrete by volume fraction of 0%, 0.5% and 1%, 1.5% to determine its flexural strength. A comparison was made between the flexural
strengths of conventional concrete and glass fibre concrete. Beams of size 1800 mm × 150 mm × 200 mm were cast with concrete containing glass fibre and fly ash and tested under static and cyclic loading. The load-deflection behaviour under static loading was studied experimentally and the same compared with numerical analysis performed using ANSYS software package. Rectangular concrete beams were also cast with concrete containing fly ash and varying percentage of glass fibre and tested under slow cyclic load applied at midspan of beam to understand, in general, its behaviour. The beams were tested under three point bending. The tested beam exhibited hysteretic behaviour. Finally, it has been concluded that addition of fly ash and glass fibre yields a better concrete for construction of structures.

**Key words:** Concrete, Fly ash, Glass fibre, Aspect ratio, Static loading, Flexural properties, Load-deflection behaviour, Cyclic loading, Hysteresis loop.