ABSTRACT

Fly ash is a residue left after burning of coal in thermal power stations and need suitable disposal system so that it does not become hazardous and injurious to human life and environment. Besides the use of fly ash as partial replacement material, its use as aggregate in concrete can pave the way for large scale use of fine aggregate. Most of the previous research works were done by using conventional fine and coarse aggregates in concrete. In this research work, the fine and coarse aggregates were completely replaced by fly ash aggregates in concrete.

Mix design was done for M20 grade of concrete by IS method. The design of fly ash aggregate concrete mix based on the extensive experimental investigations at the Building Research Station UK was followed to design the mix proportions for fly ash aggregate concrete. Ordinary Portland cement of 43 grade was selected and fly ash aggregates were prepared by mixing fly ash with 43 grade cement. The fly ash aggregates were sieved and the aggregates having size less than 4.75mm were taken as fly ash fine aggregate and above 4.75mm to 20mm were taken as fly ash coarse aggregate. 20mm size fly ash aggregates were sieved separately and used as fly ash coarse aggregate for the experimental work.
The properties of fly ash fine aggregates and fly ash coarse aggregates were determined. The aggregate crushing value and aggregate impact value of fly ash coarse aggregates were also determined.

The cement and fly ash proportions of 10:90, 12.5:87.5, 15:85, 17.5:82.5, 20:80 and 22.5:72.5 were adopted with a suitable water cement ratio 0.3 to prepare the fly ash aggregates. The method of formation of fly ash aggregates is called Pelletisation. The concrete cubes, cylinders and beams were cast with the fly ash aggregates obtained from the above six cement fly ash proportions. Then the cube compressive strength, split tensile strength, flexural strength and cylinder compressive strength tests were conducted at different ages and compared with conventional control concrete. Over the past decade steel and concrete have become the most commonly used materials for constructing different types of manmade structures. Concrete, a composite material with steel had become one of the most popular materials in civil construction. Quality of concrete depends upon the durability of concrete which is influenced by the environment, cover to the embedded steel, the type and quality of constituent materials, the cement content, water-cement ratio and permeability of the concrete. Of the above, permeability is the main factor that influences the durability more. Due to the permeability, aggressive ions in the form of liquids and gases will enter into the concrete and affect the steel in concrete. Fly ash aggregate concrete, if properly proportioned, placed and makes a substantial improvement in enhancing the protection of embedded
reinforcing steel in concrete. The durability tests like saturated water absorption, sorptivity, corrosion, rapid chloride ion penetration, acid resistance, and carbonation were conducted on the fly ash aggregate concrete and compared with control concrete.

From the studies conducted, it was observed that fly ash aggregates play a vital role in improving the strength and durability aspects of concrete.