ABSTRACT

Disposal or utilisation of Pulverised Fuel Ash (PFA) has been a matter of concern of engineers and environmentalists as it is available abundantly. About five decades before PFA was identified as an artificial pozzolan. As on date researchers and scientists have clearly brought to focus the basic principles and mechanisms by which PFAs contribute to the strength of concrete. However, the exact phenomena that control the strength attainment of PFA concrete and mix proportioning techniques are yet to be understood fully.

The present investigation envisages two phases of studies on PFA. In the first phase of strength study, four grades of reference concrete mixes (viz., M15, M20, M25, M30) were proportioned for medium workability. In order to achieve same workability for PFA concretes at same water / cementitious ratio as that of reference mixes, PFA addition was extended up to twice the weight of cement removed. In all the mixes cement was partially replaced by PFA in various proportions. To adjust the yield of concrete two schemes of aggregate adjustments have been adopted. Compressive strengths of specimens were obtained up to one year, whereas flexural and split tensile strengths were found out up to 90 days of curing. Addition of PFA imparts distinct strength gain in concrete depending upon the richness of the mix. The reasons for strength gain have been explained with necessary theories. Linear relationships have been observed to exist between compressive strength of PFA

concretes and the amount of PFA. From these relationships optimum quantity of PFA required for a given strength at a desired age could be assessed. Efficiency of PFA and its impact on strength attaining characteristics are discussed in this work.

In the second phase of the investigation rebar corrosion-resisting characteristics of PFA concrete has been carried out. M15 grade of concrete has been considered for this purpose as this grade of concrete is prevalently used in India for all general constructions. Three PFA samples of NLC collected during three different occasions have been used. Specimens were exposed outdoor in sodium chloride solution (7%) for a span of two years. Electrical resistivity and alkalinity of OPC/PFA concretes have been determined along with the rate of corrosion of rebars after various periods (max. two years) of exposure. The rate of corrosion has been determined both by gravimetric and electrochemical methods. Addition of PFA, in general, is observed to be beneficial from the corrosion point of view also. PFA samples collected during various occasions from a source were not found to perform distinctly from one another.

Based on the rate of corrosion and tensile strength data life span of concretes have been quantified using regression models. PFA concrete is found to have 65% more life span than the reference concrete.