ABSTRACT

Author has carried out experiments to decide the suitability of metakaoline (as super pozzolona) instead of silica fume. Considering both mechanical properties and durability of concrete, optimum percentage of metakaoline should be between 9 to 11%. 2% addition of millscale helps in increasing sulphate resistance. An author has tried out six different compositions of multiblended cement, containing various proportions of OPC (100% to 38% Type A to G), 10% metakaolin + 2% millscale (Type B to G) and activated flyash (10% to 50% Type C to G)

Physical and mechanical properties of prepared multiblended cement were determined. They are as per IS specifications. For each cement composition, concrete mix with four different water/ cement ratios like 0.4, 0.45, 0.5 and 0.55 were prepared. Different tests were carried out like workability, mechanical properties and durability to find out the effect of different constituents like metakaoline, mill scale and activated flyash. Following tests were performed for prepared concrete mix:

(1) Workability
(2) Compressive Strength of Cubes and Cylinders.
(3) Split strength test for Cubes and Cylinders
(4) Flexural strength of concrete
(5) Modulus of Elasticity of concrete.
(6) Durability tests like
  6.1 Sorptivity
  6.2 Rapid Chloride Permeability Test (RCPT)
  6.3 Accelerated Corrosion Test (ACT)
  6.4 Chemical Resistance like Sulphate, Chloride and Sea Water and alkali.
(7) Accelerated strength of concrete cubes

In addition to these, regression equations were developed for multi component blended cements, which suggest the relation between 56 days normal curing strength and accelerated curing strength.

Based on experiments it was found that optimum composition must contain 30% to 50% pozzolonic material to have better mechanical properties along with excellent durability. It is observed that metakaoline helps in reducing durability (RCPT value) while millscale helps in increasing sulphate resistance.

Unique concrete mix design procedure was developed for multi blended cement, without using any mix specific design code.