ABSTRACT

Self-Compacting Concrete is a highly fluid concrete mixture with no segregation and can compact under its self weight. The use of SCC is spreading all over the world, but it is in infant stage in India.

SCC requires considerably more quantity of fine particle as compared to traditional concrete to achieve self-compactability. Looking at the potential of cementitious constituents in fly ash and availability in abundance in million tonnes as a byproduct of the thermal power plant demanding environmental solution, large volumes of fly ash, partially in substitution for cement and partially as filler, can be employed in SCC. The entire investigation is divided into four distinct phases of activities.

In the first phase, the grade of concrete for the study was chosen as M25 and mix proportion for the normal concrete of this was designed by IS code method. In self-compacting concrete, equivalent mix was chosen as per literature in reference.

Self-Compacting Concrete is mixed with three different superplasticizers and three different VMA with a chosen fly ash content were prepared by varying combinations and the dosages and their properties in the fresh state viz, passing ability, filling ability and segregation resistance were studied for the assessment of the self-compactability. Cube specimens were cast in the mixes, which performed satisfactorily in the fresh state, to determine the density and compressive strength in the hardened state. From the density and compressive strength results, the better combination and
dosage of VMA and superplasticizer to produce good Self - Compacting concrete were selected.

In the second phase, for the selected VMA and superplasticizer and their dosage, mixes were prepared by varying fly ash content from 25 to 50 % in steps of 5% and the w/cm ratio as 0.30, 0.35 and 0.40 and their combinations. Concrete cubes, cylinders, prisms, pull out test specimens and impact strength test specimens were prepared and tested. Based on the above test results the optimum percentage of fly ash was decided. Based on the above results empirical relations were developed.

Flexural strength of reinforced concrete beam specimens and reinforced SCC beam specimens and axial load carrying capacity of reinforced concrete column specimens and reinforced SCC column specimens were studied in the third phase. The SCC beam and column specimens were investigated with three different water to cementitious ratio. The results of reinforced SCC beams and columns were compared with the normal reinforced concrete beams and columns and the results were discussed.

In the fourth phase, an exterior beam - column joint was considered for investigation with w/cm ratio of 0.30 which was identified in the above phase. Two sets of reinforcement detailing were adopted for the investigation. One set of specimen was detailed with normal reinforcement and the other was detailed for seismic forces. The load carrying capacity of reinforced SCC beam - column joints and their ductility factor were obtained and compared with normal beam column joint and the results were discussed.