CHAPTER 3

OBJECTIVE, SCOPE OF THE INVESTIGATION AND STRATEGY ADOPTED

3.1 Objective of the Investigation

The objective of the experimental investigations are to check the effect of use of fly ash concrete reinforced elements as compare to cement concrete elements in aggressive environment and normal condition are,

- To evaluate the effect of just replacing the cement by fly ash used in concrete and to study the compressive strength of concrete under varying percentage of fly ash, as well as to study, the effect of varying curing time period under different exposure condition.

- To understand the actual behavior of concrete when fly ash has been replaced by cement and to ascertain strength of concrete which is one of the important criteria of the concrete, in different exposure conditions in different loading behavior.

- To understand the complex interaction of materials in corrosion of reinforcement in aggressive conditions.

- Study of service life of RC members cast with concrete incorporating fly ash ,against rebar corrosion, with micro cracks in the tension zone, vis-à-vis OPC concrete members.

- To determine the optimum level of cement in concrete elements with highest compressive strength.

- Study of flexural behavior of R.C. element with age and curing of concrete, when it is casted with OPC and incorporated by fly ash in normal condition and in aggressive condition.
Study of behavior of Ferro cement and R. C. plate, subjected with uniform point loads, study of crack patterns, yield line pattern, when it is casted with OPC and incorporated by fly ash in normal condition and in aggressive condition.

Comparison of ultimate and characteristic strength of concrete, caste with OPC and incorporating fly ash in normal and aggressive condition.

Comparison of theoretical and experimental moment resistance of flexure elements, when it is casted with OPC and incorporated by fly ash in normal condition and in aggressive condition.

Study the effect of fly ash incorporating in concrete on permeability in normal condition and aggressive condition.

Study of bond strength of rebar due to corrosion in aggressive condition

3.2 Scope of the Investigation

There is wide Scope of investigation of work to be carried out for long term study for incorporation of fly ash cement (multiblended) concrete in plain concrete and reinforced concrete and their performance in normal as well as aggressive environment. It seems fly ash concrete improves the workability and strength and it improves the level of micro cracking in the transition zone and thus improves durability of concrete. This has to be studied by measuring flexure strength, tensile strength, permeability, resistance to sulfate and chloride attack, and the effect of temperature on residual compressive strength of fly ash concrete.

Durability of concrete exposed to severe conditions such as saline water can be studied. For higher percentage of fly ash, with low water binder ratio the strength and durability parameters can be studied.

Use of fly ash as corrosion inhibitors in RC elements in normal condition and aggressive conditions.
The study of effective repair of deteriorated reinforced concrete structures with consideration of causes and extent of deterioration.

There is need of to develop a well planned research programme to use fly ash in concrete to replace cement to mitigation of corrosion of rebar with increase in ductility of concrete element which is very useful in dynamic loading conditions.

3.3 Strategy Adopted

This work presents methodology that uses in study of effects of fly ash, when it is incorporated in concrete in normal and aggressive environment condition, subjected with various behaviors of loading. No detail investigation work has been reported for concrete incorporated with fly ash as a replacing binder of cement, in behavior of RC element in different condition. To do so following strategy was adopted.

- The survey of the quantum of fly ash generation and quality of fly ash is carried out. The main requirements, which govern the performance of fly ash in cement and concrete, obtain from any one source for specific surface area, residue on 45 μ sieve, unburnt carbon, commonly measured as loss on ignition(LOI), moisture content and glass content are measured in laboratory.

- To determine the optimum percentage replacement of cement by fly ash for ultimate characteristic compressive strength of concrete, 10%, 20%, 30% and 40% fly ash, the cubes were casted and tested to determine average compressive strength in N/mm² with curing of 7, 28, 56, 112, and 365 days in normal condition.

- To determine characteristic compressive strength of concrete with fly ash, the cubes were casted with plain cement concrete and with 10 %, 20 %, 30% and 40 % fly ash replacing cement and kept in sea water in (aggressive) condition. Then tested to determine average compressive strength in N/mm² with curing of 7, 28, 56, 112, and 365.

- To establish the effect of fly ash in flexure behavior, the R.C. beams were cast from concrete with and without fly ash, of size 150mm × 150mm × 700mm having reinforcement 10 mm φ bars at top and 12 mm φ 2 bars at bottom with 15 mm cover
and tested after certain days cured in aggressive conditions and normal condition, in pure bending. The results obtained in accordance with cracking load, Ultimate load, Crack width, bending stress etc.

- To studied the effect of fly ash in concrete of R. C. plate elements, the R. C. Plates of 620mm x 620mm x 50mm, with 6mm dia. 5 bars in both direction were tested with 16 point uniformly distributed loads after curing of 28, 56, 112 and 365 days curing in different conditions. Ultimate moments calculated theoretically and obtain experimentally are compared.

- To studied the effect of fly ash in Ferrocement mortar plate elements, the ferrocement Plates of 500 mm x 500 mm x 25 mm, with weldmesh as a reinforcement of 2mm dia. bar at centre to centre distance of 18 mm in both direction were tested with 16 point uniformly distributed loads after curing of 28, 56, and 365 days in different conditions. Ultimate moments calculated theoretically and obtain experimentally are compared.

In all the laboratory experiments, the influence of fly ash on workability, water demand, heat of hydration, permeability, resistance to corrosion, AAR and sulfate attack, failure pattern and crack width during tests and central deflection in flexure member were studied.