CHAPTER- 3

OBJECTIVES OF PRESENT STUDY

The concrete technology is undergoing rapid changes continuously. Once upon a time concrete was just the mixture of cement, sand, aggregate and water. Over the period of time the concrete has undergone sea changes, and today the concrete is not a mixture of mere the four components viz., cement, sand, aggregate and water. Recently the concrete technologists have shown that many solid wastes, industrial wastes, agricultural wastes or any other types of wastes can be effectively used in concrete to enhance the properties of concrete. Thus, the environmental pollution can be checked to some extent by using these wastes in concrete. Some of the industrial wastes like fly ash, silica fume, blast furnace slag etc have already established their usage in concrete. Some of the agricultural wastes like rice husk ash, natural fibres etc have also found their application in concrete.

Similarly the researches have shown that the waste glass can also be used in concrete. It has been estimated that several million tonnes of waste glasses are generated annually worldwide. The key sources of waste glasses are waste containers, window glasses, window screen, medicinal bottles, liquor bottles, tube lights, bulbs, electronic equipments etc. In most of the countries this waste glass is currently used as a landfill material. Some of the countries are recycling this waste glass without degradation of its physical properties. However, due to tolerances on contamination there is a practical limit and it is estimated that approximately 6,50,000 tones per year of waste container glass cannot be recycled into a new glass. But recently the research has shown that the waste glass can be effectively used in concrete either as glass aggregate (as fine aggregate or as coarse aggregate) or as a glass pozzolana. Waste glass when grounded to a very fine powder shows some pozzolanic properties. Therefore the glass powder to some extent can replace the cement and contributes for the strength development.

Expansive alkali silica reactions (ASR) can occur between glass particles and cement paste, particularly in moist conditions and with high alkali cements. However by controlling the reactive silica, cement alkali level and moisture, the reaction can be reduced or totally mitigated. But many other properties of concrete containing waste glasses are to be tapped. Thus, there is a need to investigate in detail about the effect of addition of waste glass in concrete.

Finely ground glass has the appropriate chemical composition to react with alcalins in cement (pozzolanic reaction) and form cementitious products. The pozzolanic properties are likely to be derived from the high SiO₂ content of glass. Powdered glass used in combination with Portland cement contributes to the strength development. Various suppressants can minimize ASR of glass aggregate concrete. Pulverised fuel ash (Pfa) and metakaolin (MK) can completely eliminate ASR. Replacing cement by pozzolanic material like waste glass powder in concrete, not only increases the strength but also enhances durability characteristics. Replacement of cement by waste glass powder can achieve economy also.

Fibre reinforced concrete is gaining more momentum these days in view of the better ductility characteristics. It can become a suitable material where the earthquake forces are prone to cause damage. In such structures the energy absorption capacity of the materials plays an important role. The introduction of the different fibres like steel, polypropylene, carbon or any other such fibres will induce more energy absorption capacity for the concrete.
Objectives of Present Study

Glass powder being a pozzolana, a small part of cement can be replaced in the fibre reinforced concrete. The action of glass powder in fibre reinforced concrete needs to be investigated.

Sufficient literature is not available on the effect of addition of waste glass in concrete. Very scanty literature is available on the performance of concrete containing waste glass powder. This experimental investigation throws some light on the behaviour of concrete as well as steel fibre reinforced concrete containing waste glass powder as pozzolana. Thus the main objective of this experimental investigation is to develop SFRC containing waste glass powder as construction material/building material. To arrive at basic properties of concrete containing waste glass powder, few experiments on workability characteristics, strength characteristics and durability characteristics are planned. To study the behaviour of steel fibre reinforced concrete containing waste glass powder as pozzolana in different percentages, the following experimental programme is planned.

1. Effect of replacement of cement by waste glass powder on workability and strength characteristics of steel fibre reinforced concrete (SFRC).
2. Effect of sustained elevated temperatures on the properties of SFRC containing waste glass powder as pozzolana.
3. Effect of freezing and thawing on the properties of SFRC containing waste glass powder as pozzolana.
4. Effect of chloride attack and sulphate attack on the properties of SFRC containing waste glass powder as pozzolana.
5. Effect of sulphate attack with alternate wetting and drying on the properties of SFRC containing waste glass powder as pozzolana.
6. Effect of acidic attack on the properties of SFRC containing waste glass powder as pozzolana.