CHAPTER 6

CONCLUSION

From the experimental studies concerning the strength and durability behavior of concrete containing quarry dust as fine aggregate with mineral admixtures and inhibitors, the following conclusions have been obtained.

6.1 SIGNIFICANCE OF QUARRY DUST

- The concrete containing quarry dust as fine aggregate can be effectively utilized in the construction industry with good quality materials, appropriate dosage of super plasticizer, appropriate mixing methods and proper curing.

- Addition of super plasticizer not only reduces the water content without affecting the workability but also enhances the strength slightly due to effective dispersibility of cement agglomerates in the concrete.

- EDAX analysis shows that the chief element present in the quarry dust is silica (Si) along with aluminium, calcium and iron in lesser quantities.

- When comparing with conventional concrete, the quarry dust concrete shows 8.75%, 2.5%, 1.68% and 5.68% increase in compressive strength, split tensile strength, flexural strength and bond strength respectively and the corrosion resistance performance is also 10.6% greater than conventional concrete.
The utilization of quarry dust as fine aggregate in concrete saves 8.15% of the construction cost.

6.2 INFLUENCE OF MINERAL ADMIXTURES

- Among all the percentages of fly ash, 30% replacement of fly ash shows maximum strength and corrosion resistance properties. The increase in compressive, split tensile, flexural and bond strength for 30% fly ash after 180 days is found to be 28.84%, 22.52%, 18.17% and 24.36% respectively.

- 30% fly ash blended quarry dust concrete shows 30.69% and 27.68% improvement in corrosion initiation time and corrosion resistance and also 28.75% reduction in corrosion rate. Hence, the optimal replacement level of fly ash in quarry dust concrete is found to be 30%.

- Among all the percentages of GGBFS replaced, 40% of GGBFS have shown 23.84%, 21.72%, 20.95% and 22.22% improvement for compressive, split tensile, flexural and bond strength respectively.

- Specimen with 40% GGBFS shows 21.9% increase in corrosion initiation time, 25.68% improvement in corrosion resistance and 21.5% reduction in corrosion rate. Hence, the replacement level of 40% of GGBFS is considered to be the optimum level of cement replacement in quarry dust concrete for getting maximum strength and corrosion resistance.

- Moreover, utilization of quarry dust and industrial by-products in the construction industry will lead to a wide range of economic and environmental benefits.
6.3 INHIBITIVE EFFECT OF INHIBITORS

- The incorporation of inhibitors shows very lower permeability and water absorption.

- Among the various percentages of organic inhibitors added, the specimens with 2% addition of triethanolamine, diethanolamine and diethylamine show maximum improvement in all the strength properties and corrosion resistance when compared with the control specimen.

- Considering strength as well as corrosion resistance, the optimum percentage addition of inorganic inhibitors by weight of cement in concrete containing quarry dust as fine aggregate is found to be 2% for calcium nitrite and 3% for calcium nitrate and sodium nitrate.

6.4 COST ANALYSIS

- The cost wise comparison of the quarry dust concrete with the conventional concrete proves that the quarry dust concrete stands to be cost effective saving about 8.15% of the total cost involved.

- In the case of mineral admixtures, the cement replaced with 30% of fly ash saves 21.23% and the replacement level of 40% GGBFS saves 26% of the construction cost. However, based on the strength, corrosion resistance and availability 30% fly ash blended quarry dust concrete is recommended.

- When comparing the cost of all the inhibitors, calcium nitrate is found to be economical and the strength and corrosion resistance performance is found to be satisfactory.
From the above conclusions and comparison of the costs of the materials it has been arrived that 30% fly ash blended cement concrete containing quarry dust as fine aggregate can be effectively and economically utilized in the construction industry. The utilization of quarry dust and fly ash also contribute to a very satisfactory outlet of these industrial by-products which were earlier considered as waste materials and dumped on huge quantities on barren lands causing pollution problems to the surrounding localities. Conversion of these into effective construction material not only reduces the construction cost but also leads to a wide range of environmental benefits and ensuring sustainable development against environmental pollution. For the construction works in chloride laden coastal areas requiring strength and corrosion resistance, quarry dust concrete with 3% calcium nitrate as inhibitor can be effectively and economically utilized.

6.5 SCOPE FOR FUTURE STUDY

The present investigation can also be extended to study,

1. Inhibitive effect of inhibitors in 30% fly ash blended quarry dust concrete

2. Influence of rice husk ash on the strength and durability of concrete containing quarry dust as fine aggregate.

3. Strength and corrosion resistance behavior of concrete containing quarry dust as fine aggregate with silica fume.

4. Role of fibres in enhancing strength and durability characteristics of quarry dust concrete