CHAPTER 6

CONCLUSIONS

6.1 GENERAL

The present investigation is concerned with the evaluation of the performance of quarry dust in place of sand in concrete. Experimental investigation was carried out to study the various parameters of strength and durability.

6.2 CONCLUSIONS FROM THE EXPERIMENTAL INVESTIGATION

The following conclusions were arrived at from the experimental investigation:

- Addition of quarry dust decreases workability. To maintain the workability constant, addition of more cement to maintain same water cement ratio (or) same quantity of cement with higher water cement ratio is to be followed. In this work, keeping the cement quantity constant the w/c ratio is varied. Rough textured, angular, elongated particles require more water to produce workable concrete than do smooth, rounded compact aggregate. PPC used concrete need more water than OPC used concrete because PPC is finer than OPC having more specific surface requiring more water to wet.
- Maximum compressive strength is obtained at 30% and 50% sand replacement by fine and medium (or) coarse quarry dust respectively. The percentage of variation in compressive strength compared with control concrete is more for lower grade and less in higher grade of concrete due to reduction in quarry dust quantity. Sharp edges of quarry dust particles provide better bond with cement than the rounded particles of natural sand resulting in higher strength.

- Maximum tensile strength is obtained at 50% sand replacement by quarry dust, whereas replacement is possible upto 80%. The increase in tensile strength was due to the bond between cement paste and aggregate. This is due to particle shape change from smooth and rounded to rough and angular in the case of quarry dust.

- Maximum flexural strength in plain and RCC beams are obtained at 50% sand replacement by quarry dust, whereas replacement is possible upto 80%. This is due to better bond strength at the interface of concrete and also with reinforcement.

- The reduction in compressive strength due to temperature effect is minimum at 50% sand replacement by quarry dust. Maximum compressive strength at lower temperature was due to stronger interfacial bonding between matrix and aggregates. Strength loss at higher temperature may be due to change in the texture of the sample into coarse and due to several micro
cracks, which gradually worsen the strength character of the sample.

- There is an additional reduction in compressive strength due to thermoshock compared with temperature effect at 100°C. The minimum reduction is obtained at 50% sand replacement by quarry dust. The capacity to absorb energy through impact of concrete subjected to thermoshock is reduced greatly and a weaker plane with micro cracks developed inside results additional strength loss.

- PPC used concrete withstand temperature better than OPC used concrete. While comparing the reduction in compressive strength of OPC used concrete and PPC used concrete with control concrete, it is found to be 20.66% in OPC and 14.14% in PPC when heated to 100°C for 24 hours. The heat withstanding capacity is greater in PPC used concrete is due to the inherent carbon content in pozzolana.

- Due to the addition of superplasticizer at 1.2 lit/100kg of cement, the percentage of reduction in w/c ratio is nearly 5%. The increase in strength is nearly 5%, 3.5%, 2.5% and 10% in compressive strength, tensile strength, flexural strength of plain and RCC beam respectively. Superplasticizer occupy the voids reduces voids ratio leading to dense concrete which gives better strength.

- There was reduction in permeability due to the addition of superplasticizer when compared with normal concrete. This
decrease in permeability is due to the dispersive action of admixture on the cement particles and refinement of pore size.

- The savings in cost of optimum quarry dust used concrete is Rs. 337 per cubic metre. The percentage of savings in cost of concrete per cubic metre is 6.50, 5.70 and 4.57 for M15, M20 and M25 grades respectively.

These results on strength and durability studies give a clear conclusion that quarry dust can be used as a good substitute for natural river sand with higher strength at 50% replacement, saving in cost of concrete and reducing the demand for sand.
6.3 RECOMMENDATIONS FOR FURTHER RESEARCH

- The compressive, tensile and flexural tests were carried out at the age of maximum 28 days only. It can be extended to higher ages.

- The experiments on thermal effect and thermoshock were carried out at 100°C only. The thermal effect and thermoshock experiment can be carried out at elevated temperatures.

- To determine the bond strength between reinforcement and concrete pullout test can be carried out.

- To test for durability, other tests such as Rapid Chloride Penetration Test, Acid test can be carried out.