

Investigation on Utilization of Fly Ash, Marble Dust and Stone Dust in OPC Concrete

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Abstract— In India large amount of fly ash is generated in thermal power plant with a major effect on environmental and living organism. Concrete has become very important construction material and it is now used in huge amount of quantities than any other material. In the present time strength, durability and economy of any construction project is affected.

Keywords: Fly Ash, Marble Dust, Stone Dust, OPC Concrete

I. INTRODUCTION

The use of fly ash, marble dust & stone dust in concrete can reduce the ingesting of natural resources and also reduce the effect of pollutant in environment. Fly ash is one of the residues that is produced in burning of coal.

Cement, sand and aggregate are such component which is used for any types of construction. Concrete cannot progress upright strength without mixing of natural sand in concrete. There is absence of natural sand due to more ingestion in construction work. Therefore the construction industry is facing various problems and failing to accomplishment of project on the time within given duration. Hence there is need to find the new different constituents to replace the river sand. Many researchers are discovery different materials to replace sand and one of the major materials is marble dust and quarry stone dust. Using different fraction of these marble dust and stone dust along with sand necessary concrete mix can be obtained.

Since last few years marble is considered one of the most important decorative building materials.

II. LITERATURE REVIEW

Several studies have been carried out to examine the assets of fresh and hardened concrete like slump flow test, compaction factor test, compressive strength test, split tensile test etc by moderately or fully substituting the Fly ash, marble dust and also natural sand is replaced by marble dust, stone dust is proven to be a cost effective environmental friendly different to the natural fine aggregates.

III. MATERIALS

The main ingredients of concrete mix are as follows.

A. Cement (binding material):-

Portland cement is most common type cement in general use around the world, used as a basic constituents of concrete.

There are many type of cement and they are variable the proportions of various oxides.

Ordinary Portland cement is classified into three grades that is opc 33, opc 43 and opc 53 depending upon the strength of cement contingent upon their strength at 28 days for 33 grade strength should not be less than 33 N/mm², if the strength is should not be less than 43 N/mm² then it is 43

grade and if the strength is not less than 53 N/mm² then it is called 53 grade.

B. Aggregate (coarse and fine)

Aggregate currently needed by final market sector was 30%-35% for non-residential building (offices, hotels, stores, government and institutional building and others). Aggregate can divided into two categories, coarse aggregate and fine aggregate.

Coarse aggregate more than 4.75 mm and fine aggregate less than 4.75 mm is considered.

C. Water

According to IS: 456 water approving to necessity meet for producing concrete mix. Water used in concrete should be free from organic impurities. In concrete mix, the water must is reduced to the value required for hydration of cement.

D. Fly Ash

Fly ash or fuel ash also known as pulverized ash or coal combustion residuals. Fly ash is generally taken from the chimneys of coal – fired power plants. In IS: 3812 code is used for specification of fly ash or pulverised ash.

E. Marble dust

Since last few years marble is measured as most important attractive building materials. Marble powder is one the materials which disturb the environment and health problems. It is produced from cutting, shaping and enhancing process. The main variable taken into consideration is the percentage of marble dust partial replacement of sand in concrete mixes.

F. Stone Dust

The most extensively used fine aggregate for making of concrete is the natural sand and excavated from river beds. It could be used as a partial or full replacement of natural sand due to absence of natural sand. Also the utilization of mine waste will reduce the budget of concrete production.

IV. TESTS ON MATERIAL

A. Standard consistency of cement

As per IS: 4031 the standard consistency of cement is defined as the consistency which allow the “ Vicat Plunger to penetrate to a point 5mm to 7mm from the bottom of the mould”.

B. Initial setting time of cement

As per IS: 1439 part-1, the initial setting time of cement is should not be less than 30 minute.

C. Final setting time of cement

As per IS: 1489 part-1, the final setting time of cement is 600 minute or 10 hours.

D. Specific gravity of cement

As per IS: 4031 part 11 (1998), specific gravity of cement is determined.

E. Specific gravity test on Coarse Aggregate

AS per IS: 2386 (part-III) 1963, the specific gravity of coarse aggregate is 2.5 to 3.

F. Water Absorption Test

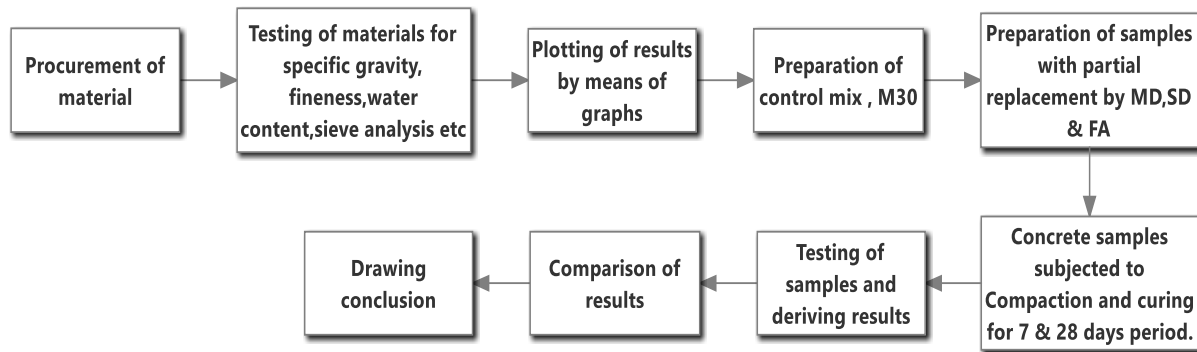
As per maritime code BS 6349 specifies that the water absorption should not exceed 3% or 2% in critical conditions.

G. Bulk Density of Coarse Aggregate

The value of bulk density of coarse aggregate is obtained from the IS: 2386 part3 (1963).

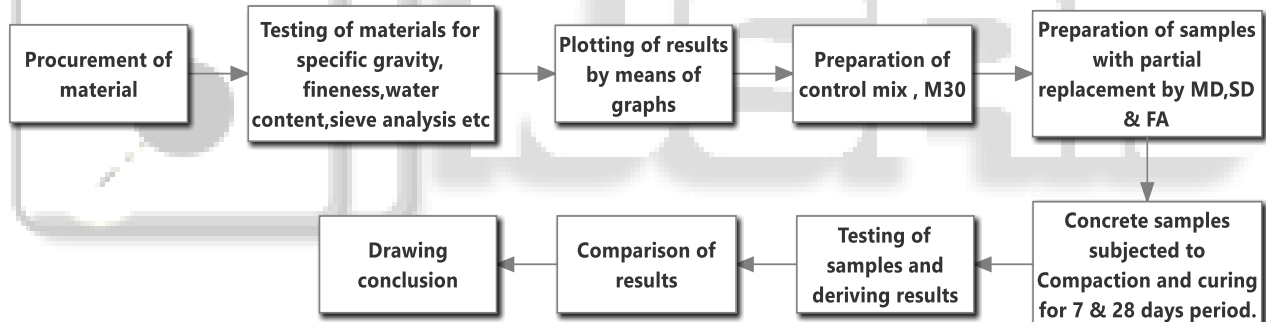
V. METHODOLOGY

The essential material for test is gather and stored in lab for carried out study work. For study of possessions of materials various tests are perform like specific gravity, water content, sieve analysis and impact test etc are carried out. These parameters are explained with the help of graphs.



To observe the distinction of various samples made with partial replacement by fly ash, marble dust or stone dust, the control mix of M30 is ready which has usual and specific strength and other properties. The samples of compacted during casting of cubes and cured for 7 days and 28 days.

Samples cured for 7 days and 28 days are tested for compressive strength after curing for respective days. Based upon results testing values the conclusion are drawn the best possible outcome recommended.



VI. RESULT AND DISCUSSION

The resulting table gives the test result of control concrete. The 28 days strength obtained for M30 grade of concrete is 38.66 M.pa

Grade of concrete	7 days	28 days
M30	25.78N/mm ²	38.66N/mm ²

VII. CONCLUSION

The following observations were made as result of experiments.

- 1) Water cement ratio greater than before with adding of fly ash than control mix in diverse mix.
- 2) The maximum compressive strength was achieved in mix M14 than other diverse concrete mixes M1-M13.
- 3) The maximum compressive strength was attained about 6.86% higher than control concrete.
- 4) In concrete cement can be substituted with 20% fly ash with maximum increase in strength away from starts decreases.

- 5) The study presented that the early strength of fly ash and by invention of burnt coal concrete was found to be less and the strength increased with age.

VIII. SCOPE OF ADDITIONAL WORK

A minor percentage that is 3% to 5% of fly ash is being used in India. Whereas in other nation state the percentage of application is 30% to 80%. Whatever be the type of fly ash, it sources of pollution and air borne infections such as silicosis, fibrosis of lungs, bronchitis etc. Fly ash that is being used up (tones/day) by numerous organizations in construction of cement, bricks, cellular blocks, asbestos sheets and substantial low lying zones and construction of road.

REFERENCES

- [1] Prof. Dr. Bahar Demirel, study of "THE EFFECT OF THE USING WASTE MARBLE DUST AS FINE SAND ON THE MECHANICAL PROPERTIES OF THE CONCRETE" Pp. 1372- 1380, 18 August 2010

- [2] Priyanka, Jadhav, Dilip k. , Kulkarni “EFFECT OF REPLACEMENT OF NATURAL SAND BY MANUFACTURED SAND ON PROPERTIES OF CEMENT MORTAR” International journal of Civil and Structural Engineering, Vol-3, No 3, ISSN 0976-4399,2011.
- [3] Hanifi Binici, Hasan Kaplan and Salih Yilmaz, (2007), “INFLUENCE OF MARBLE AND LIMESTONE DUSTS AS ADDITIVES ON SOME MECHANICAL PROPERTIES OF CONCRETE” Science Research and Essay, 2(9), pp 37237.
- [4] Anjali H Jamale, Urmila R Kawade “EFFECT OF QUARRY DUST AND FLY ASH MIX ON SRENGTH PROPERTIES OF M40 GRADE OF CONCRETE” International Journal of Engineering Research and General Science Vol-3, Issue 3, part-2, May-June, 2015 ISSN 2091- 7758.
- [5] A krishanmurti, and G. Mohan kumar “PROPERTIES OF GREEN CONCRETE MIX BY CONCURMENT USE OF FLY ASH AND QUARRY DUST” IOSR Journal of Engineering (IOSRJEN) e-ISSN: 2250-3021, p-ISSN: 2278-8719 Vol 3, Issue 8 August 2013.

