ISSN(Online) : 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

Experimental Study of Coarse Aggregates and Fine Aggregates Replaced By Ceramic Waste and Quarry Dust

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ABSTRACT: Concrete is one of the important construction material used in the world of all engineering works including the infrastructure development proved that, it is a cheap material and its constituents are widely available in nature. Due to wide spread usage and fast infrastructure development in all over the world, there is shortage of natural aggregates, Such as fine aggregate and course aggregate. These materials are available with high cost, to prevent this the fine aggregate and course aggregate can be replaced with waste materials. In this project work fine aggregates will replaced by quarry sand and course aggregate will replaced by ceramic waste accordingly in the range of 0%, 10%, 20%, & 30% by weight of M-25 grade concrete. Sieve analysis is done for Ceramic waste and Quarry dust for the replacement course aggregate and fine aggregate. Concrete mixtures were prepared, tested and compared in terms of compressive strength to the conventional concrete. These tests were carried out to evaluate the strength properties for 7, 21 and 28 days.

KEYWORDS: Specific gravity test, workability test, compressive strength, ceramic waste and quarry dust.

I. INTRODUCTION

FOR Past many years construction industry has been making some progress in the utilisation of waste materials in concrete. Some of waste products are fly ash, rice husk, saw dust, discarded tires, e-waste, glass, bagasse ash, stone dust and ceramic. Proper use of waste products provides viable economy and healthy environment. Each waste product has its specific effect on properties of fresh and hard concrete. There has been a long-term growing demand for aggregates to produce concrete and this has presented increased problems of supplying of sand and gravel .Previous researches have shown crushed stone dust can be used to replace the natural sand in concrete .Recycle aggregates are also being studied though some loss in workability and mechanical property is reported .The ceramic industry has about 30% to 50% failed products due to improper mixing or heating conditions so ceramic can be used as a coarse aggregates. Present study has been done to evaluate the suitability of such waste materials in concrete production

II. MATERIALS USED

1. CEMENT:

Ordinary Portland Cement (43 Grade) with specific gravity of 2.9 was used for this experimental investigation. The testing of cement is done a per IS-4031-11-1998.

2. AGGREGATES:

Aggregates are the important constituents in concrete. They give body to the concrete, reduce shrinkage and effect economy. One of the most important factors for producing workable concrete is a good gradation of aggregates. Good grading implies that a sample fraction of aggregates in required proportion such that the sample contains minimum voids. Samples of the well graded aggregate containing minimum voids require minimum paste to fill up the voids in the aggregates.

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3. Fine Aggregate (Natural River Fine Aggregate):

The river sand is used in combination as fine aggregate conforming to the requirements of IS: 383. The river sand is washed and screens, to eliminate deleterious materials and oversize particles.Those fractions from4.75mm to 150microns are termed as fine aggregate. Locally available river sand having density of 1550 kg/m 3 and fineness Modulus (FM) of 5.02 was used. The specific gravity was found to be 2.62. The fine aggregate was found to be confirming to Zone III as per IS 383:1970. The specific gravity of fine aggregate is obtained by using the IS-2720-part 3 code.

4. Coarse Aggregate:

The fractions from 20mm to 4.75mm are used as coarse aggregate. The Coarse Aggregates from crushed Basalt rock, conforming to IS: 383 is being used. The Flakiness and Elongation Index were maintained well below 15%. Natural granite aggregate having density of 1500 kg/m3 and fineness modules (FM) of 3.14 was used. The specific gravity was found to be 2.69 and maximum size of aggregate was 20mm. The specific gravity of coarse aggregate is obtained by using the IS-2386-part 3-1963 code.

5. Quarry Rock Dust:

Quarry Dust a waste product obtained during the process of quarrying. In general a quarry dust is used a filler materials attempt was made in partial replacement of fine aggregate (sand). In addition to this, an alternative source for the potential replacement of natural aggregates in concrete has gained good attention. As a result reasonable studies have been conducted to find the suitability of granite quarry dust in conventional concrete. Quarry dust is fine rock particles. When boulders are broken into small pieces quarry dust is formed. It is gray in color and it is like fine aggregate.The fineness modulus of quarry dust is 6.184.

6. Ceramic waste:

Ceramic waste is a recycled aggregate is coming in to the ceramic industry. Ceramic waste is generated as a waste during the process of cutting, and marking. In this project study an attempt has been made to find the suitability of the ceramic industrial wastes as a possible replacement for conventional coarse aggregate. Mainly this type of recycled aggregate is used for the developments of concrete with non-conventional aggregates to improve the properties of concrete and reduce the cost.

The waste ceramics are crushed into pieces with crushing machine in laboratory. The specific gravity of ceramic aggregates is 2.27 and fineness modulus is 3.116

7. Water:

Generally, water that is suitable for drinking is satisfactory for use in concrete. Water from lakes and streams that contain marine life also usually is suitable. When water is obtained from sources mentioned above, no sampling is necessary. When it is suspected that water may contain sewage, mine water or wastes from industrial plants or canneries, it should not be used in concrete unless tests indicate that it is satisfactory. Water from such sources should be avoided since the quality of the water could change due to low water or by intermittent tap water is used for casting. The potable water is generally considered satisfactory for mixing and curing of concrete. Accordingly potable water was used for making concrete available in Material Testing laboratory. This was free from any detrimental contaminants and was good potable water.

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III. TESTS

Compressive strength:

The compressive strength values varied from 4.763 MPa to 7.175 MPa for 7 days strength. Also, it varied from 15.66 MPa to 21.26 MPa for 28 days. It was found that, there was not much variation in the compressive strength of conventional concrete and crushed stone aggregate concrete. The strength of the concrete with different coarse aggregates. The compressive strength of concrete cubes made with ceramic waste and quarry dust were found to be 16% and 26.34 % lesser respectively than that of conventional concrete. The reasons may be due to smooth surface texture of these aggregates and poor bonding properties of the matrix with aggregates.

Table: 1 Compressive Strength

Si.no.	Type of concrete	7 days N/mm^2	21days n/mm^2	28days n/mm^2
1.	Normal mix	19.51	23.32	28.62
2.	10%replacment	16.58	21.10	26.66
3.	20%replacement	19.40	27.18	29.47
4.	30%replacement	16.44	24.14	29.10

IV. CONCLUSION

The w/c ratio was kept constant for all the replacement levels of fine aggregate with quarry dust and coarse aggregate with ceramic waste.

The assumption of consideration of constant w/c ratio helps for understanding the effect of strength parameters due to the change of natural aggregates.

1. From the experiments conducted, replacement of ceramic waste as coarse aggregate in concrete can be optimized.
2. At 0% 10%, 20%, 30% replacement of coarse aggregates with ceramic waste the strength properties were decreased linearly were compared with conventional concrete.
3. At 50%, 60%, 70% & 80% replacement of coarse aggregates with ceramic waste the strength properties were marginally decreased and at 90% and 100% replacement level strength properties were highly decreased when compared with conventional cement concrete.
4. And there is no highly difference of 7 days and 28 days strength properties of compressive strength.
5. So In the further investigation 30 % replacement of ceramic waste as coarse aggregate and quarry dust as fine aggregate (sand) by conventional aggregates content in concrete can be optimized.
6. In the further investigation the combined effect of 40% replacement of coarse aggregates with ceramic waste and 15%, 30%, and 45% replacement of quarry dust with sand the strength properties were decreased linearly were observed in the combined effect of replacement of natural aggregates by recycled aggregates there is a small difference of 7 days and 28 days strength properties of compressive strength.

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REFERENCES

1) R M Senthamarai&P.DevadasManoharan. Have studied use of hazardous industrial waste in concrete making will lead to greener environment.
2) C. Medina a, M.I. Sanchez de, Rojas b, M. Fries b. Have studied to investigated the reuse of ceramic waste as coarse aggregate in co-efficient concretes.
3) Benito Mas. Have focuses on the use of mixed recycled aggregates (MRAs) as coarse aggregate or fine fraction in concrete and the influence of the cement used.
4) HanifiBinici. Have studied the Durability of concrete made with granite and marble as recycle aggregates.
5) Maria Chiara Bignozzi, Andrea. Saccanition (ASR) has studied Ceramic waste as aggregate and supplementary cementing material: A combined action to contrast alkali silica reaction (ASR).
6) IlkerBekirTopcu, SelimSengel. Has studied the properties of concretes produced with waste concrete aggregate.
7) J.R. Jiménez a, J. Ayuso a, M. López a, J.M. Fernández b, J. de Brito. Use of fine recycled aggregates from ceramic waste in masonry mortar manufacturing
8) Felix F. Udoeyo. studied properties of sawdust as partial replacement of cement. Before application in concrete, the ash was ground and sieved through a number 425 micron BS sieve.
9) Ali Ergun. Examined Effects of usage of diatomite and waste marble powder as partial replacement of cement on the mechanical properties of concrete.Construction and Building Materials 2011; 25:806-812.
10) Felix F.Udoeyo. Examined properties of Maize-cob Ash as filler in concrete as partial replacement of cement and Studied the Properties of sawdust as partial replacement of cement.J.Mater.Civ.Eng.2002.
11) Sani D, moriconi G, Fava G,Corinaldesi V. Examined the mechanical behavior of concrete manufactured with recycled aggregate. waste manage 2005;25:177-82.
12) Roz-Ud-Din Nassar and ParvizSoroushian. Studied The strength of recycled aggregate concrete containing milled glass as partial replacement for cement. Construction and Building Materials.2012.
13) Bashar Taha. Conducted properties of concrete contains mixed colour waste recycled glass as cement replacement.J.Mater.Civ.Eng.2009.
14) Augustine UcheElinwa and Yakubu Abba Mahmood. Studied the Ash from timber waste as partial replacement of cement.Cement&Concrete Composites 2002.