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STUDY ON PROPERTIES OF CONCRETE (M40) USING STONE DUST AND DEMOLISHED CONCRETE WASTE AS PARTIAL REPLACEMENT OF FINE AND COARSE AGGREGATE: A REVIEW

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Abstract- *Concrete is the mixture of fine aggregate, coarse aggregate, cement, water and admixtures. Concrete plays a vital role in the development of infrastructure viz., building, industrial structures, bridges and highways etc, leading to utilization of large quantity of concrete. So the rapid increase in the price of conventional construction materials .Additionally various government agencies have put restrictions on sand and stone and stone quarrying to conserve this diminishing natural resource.. In this context the study was carried out to find the suitability of the alternate materials such as stone dust and demolished concrete waste as a partial replacement of fine and coarse aggregate because these materials are easily available at very low cost as compared to conventional fine and coarse aggregates.*

Key words- Demolished concrete waste, Stone dust, Concrete, Waste Management.

I. INTRODUCTION

Concrete is a composite material composed of coarse granular material (the aggregate or filler) embedded in a hard matrix of material (the cement or binder) that fills the space between the aggregate particles and glues them together. We can also consider concrete as a composite material that consists essentially of a binding medium within which are embedded particles or fragments of aggregates. Utilization of alternate materials such as stone dust and demolished concrete waste as a partial replacement of fine and coarse aggregate materials may reduce the cost of concrete production and also minimize the negative environmental effects with disposal of these wastes.

Concrete is the most widely used construction material in the world. Its worldwide production exceeds that of steel by a factor of 10 in tonnage and by more than a factor of 30 in volume. The present consumption of concrete is over 10 billion tons a year, that is, each person on earth consumes more than 1.7 ton of concrete per year. It is more than 10 times of the consumption by weight of steel. Construction and demolition Waste (C&D) is produced during new construction, refurbishment or renovation of buildings. Demolition waste includes materials from complete building removal as well as partial removal when aspects of the buildings are retained, Waste includes bricks, concrete masonary, soil, rocks, lumber, paving materials, glass, plastics, aluminium, steel, drywall (gypsum), plywood (formwork), plumbing fixtures, electrical and roofing materials. C&D waste will increased from time to time proportionate with the development of the town and country. Thus, the necessity of finding appropriate solution to C&D waste destination must be clear. Reducing, reusing and recycling appear to be profitable alternatives that will increase the lifetime of landfills and reduce exploration of natural resources.

Shivkumar & Prakash (2014) carried out, the utilization of building demolished waste in the manufacturing of porous concrete as a replacement of coarse aggregate. The mechanical properties of the concrete have been investigated for nominal mix and mix design as per the mix design codes IS 10262 (2009)[8] and IS 12727 (1989)[9]. Porous concrete is no fines concrete with desired degree of compressive strength with high porosity to allow permeability. Various proportions of cement, water and percentage of coarse aggregates and building demolition wastes are used. In this paper 40:60, 50:50 and 60:40 ratio of coarse aggregate and building demolition wastes are used with water cement ratio 0.4 to 0.48,28 days cube compressive strength of average of three samples are determined. During the study, lesser density by weight and compressive strength from 5.22 MPa to 8.32MPa are observed as per IS 12727 (1989)[9] for the ratio 1:10 and 1:12 respectively. By the investigation it is found that the porous concrete results are encouraging to use as a porous material for the drainability and has been found to be comparable to the conventional concrete.

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Lakhan Nagpal[1] (2013) has revealed that possibility of using crushed stone dust as fine aggregate partially or fully with different grades of concrete composites. The suitability of crushed stone dust waste as fine aggregate for concrete has been assessed by comparing its basic properties with that of conventional concrete. Two basic mixes were selected for natural sand to achieve M25 an M30 grade concrete. The equivalent mixes were obtained by replacing natural sand by stone dust partially and fully. The test result indicates that crushed stone dust waste can be used effectively used to replace natural sand in concrete. In the experimental study of strength characteristics of concrete using crushed stone

dust as fine aggregate it is found that there is increase in compressive strength, flexural strength and tensile strength of concrete.

Mogre & Parbat[2] (2013) carried out that the experimental study of optimum replacement of natural sand with artificial sand in concrete. Concrete is a mix proportion of cement, sand and aggregate. The strength of aggregate will effect on the strength of concrete. Nowadays we are facing a problem due to scarcity of natural sand. Hence it is necessary to find suitable substitute for natural sand. The artificial sand is one of the suitable substitutes to natural sand. Artificial sand is produced from quires stone crusher. Which is specially prepared so as to get smooth textured, well graded particles. Artificial sand is cheap and easily available in local areas. For the purpose of experimentation concrete mixes are design for M20, M25, M30, M35 and M40 grades by 0 to 100% replacement with increment of 20% and in critical zone the increment is of 5% for compressive, tensile and flexural strength.

Qasrawietal[3] (1983) studied the use of concrete in structures consumes millions of tons of aggregates. Since earth is the source of the aggregate (either natural or crushed), then obtaining these amounts would have an adverse effect on the environment. Furthermore, demolishing concrete structures and dumping the concrete rubbles would aggravate the problem. Therefore, it becomes necessary to recycle the crushed concrete and use it as course aggregate in new concrete mixes. The effect of using recycled aggregates concrete (RCA) on the basic properties of normal concrete is studied. First, recycled aggregate properties have been determined and compared to those of normal aggregates. Except for absorption, there was not a significant difference between the two. Later, recycled aggregates were introduced in concrete mixes. In these mixes, natural coarse aggregate was partly or totally replaced by recycled aggregates. Results showed that the use of recycled aggregates has an adverse effect on the workability of concrete. Such an effect can be easily retained by using plasticizers. Also, concrete strength has been reduced by 5% to 25% depending on the percent of the normal aggregate replaced by recycled aggregate and the water-cement ratio. With respect to the tensile strength, recycled aggregate concrete was slightly lower.

Chandana Sukesh etal[4] (2013) studied that the reduction in the sources of natural sand and the requirement for reduction in the cost of concrete production has resulted in the increased need to identify substitute material to sand as fine aggregates in the production of concretes especially in concrete. Querry dust, a by-product from the crushing process during quarrying activities is one of such materials. Granite fines or rock dust is a by-product obtained during crushing of granite rocks and is also called quarry dust. In recent days there were also been many attempts to use Fly Ash, an industrial by product as partial replacement for cement to have higher workability, long term strength and to make the concrete more economically available. This present work is an attempt to use quarry Dust as partial replacement for Sand in concrete. Attempts have been made to study the properties of concrete and to investigate some properties of quarry Dust the suitability of those properties to enable them to be used as partial replacement materials for sand in concrete.

Ukpata et. Al[5] (2012) studied that the structural characteristics of concrete using various combinations of lateritic sand and quarry dust as complete replacement for conventional river sand fine aggregate. Samples of concrete (e.g. cubes) were made using varying contents of laterite and quarry dust as fine aggregate. The quantity of laterite was varied from 0% to 100% against quarry dust at intervals of 25%. The samples were cured for specified periods and tested in the laboratory for compressive strength. Workability tests were earlier carried out to determine the optimum water/cement ratios for three different mixes, namely 1:1:2, 1:1.5:3 and 1:2:4. It was found that 0.5 water/cement ratio produced higher compressive strengths for 1:1:2 mix, while 0.6 water/cement ratio exhibit better workability for 1:1.5:3 mix proportion. Specifically compressive strength ranged from 17-34.2 N/mm^2 for the mixes considered. These results compare favourably with those of conventional concrete. The concrete was found to be suitable for use as structural members for buildings and related structure, where laterite content did not exceed 50%.

Gowda et.al[6] (2014) studied that the reduction in the sources of natural sand and the requirement for reduction in the cost of concrete production has resulted in the increased need to identify substitute material to sand as fine aggregates in the production of concretes. Quarry dust, a by-product from the crushing process during quarrying activities is one of such materials. Granite fines or rock dust is a by product obtained during crushing of granite rocks and is also called quarry dust. This present work is an attempt to use quarry Dust as replacement for sand. Attempts have been made to study the basic properties of Quarry dust and compressive strength of Quarry dust concrete. The quarry dust behaves similar to conventional fine aggregate (sand) with respect to aggregate properties and zonal study. The optimum compressive strength is achieved at the proportion of fine to coarse with 60:40

VI. CONCLUSION

The effect on the properties (28 days compressive, split tensile and flexural strength) of normal strength concrete with partial replacement of fine aggregate by stone dust and coarse aggregate partial replacement by demolished concrete waste, with water cement ratio of 0.37% is studied. The percentage replacement of fine aggregate by stone dust is varied from 5% to 50% and coarse aggregate replacement by demolished concrete waste is varied from 5 to 50% at an interval of 5%, reviewed and it can be concluded that the Stone dust and demolished concrete waste have a potential

to provide alternative to conventional fine aggregate and coarse aggregate and helps in maintaining the environmental as well as economical balance. The compressive, split tensile and flexural strength of concrete upto 25% replacement of fine aggregate and that of upto 20% replacement of demolished concrete waste reveals approximately same strength as compared to concrete made by conventional coarse aggregate.

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