A REVIEW PAPER ON EXPERIMENTAL STUDY ON UTILIZATION OF MARBLE DUST IN PAVEMENT QUALITY CONCRETE

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Abstract - *Concrete is highly versatile construction material in nature. Concrete's constituent materials are available naturally in all parts of the world. With more construction projects everywhere and due to the great utility of concrete in constructions, with each passing day these materials are getting deficient thus asking for the alternatives. Utilization of waste material in pavement quality concrete can be beneficial in order to find an alternative solution to reduce environmental pollution. The marble stone is most widely used in the construction and it generates marble dust through cutting and polishing of the stone. Marble dust is a waste material consisting of very fine powder and thus creating environmental problems worldwide today. Disposal of this marble waste leads to health hazards like respiratory and allergy problems to the people around. It also causes the pollution of air, water and soil. In this work, systematic experimental study has been carried out using marble dust to replace sand at various replacement levels in pavement quality concrete. This study has been carried out for w/c 0.40 and 0.42 and specimens have been cast to perform various tests (Compressive Strength Test and Flexural Strength Test), durability properties (Water permeability test, Abrasion resistance test), ultrasonic pulse velocity meter test and impact test*

1. INTRODUCTION

Rigid pavements or cement concrete roads are built with a top layer of high quality concrete called as Pavement Quality Concrete. It should have high strength so as to distribute the wheel load of the vehicles to the bottom layers without any deformation. It should minimize the skidding of vehicles. The use of good quality conventional materials in road construction is becoming increasingly expensive in India due to the increasing demand as well as its scarcity in nature. Further the development and use of new modified paving materials in road construction results in high performance pavement to meet the communities. So, attempts should be made to utilize industrial and agricultural wastes effectively in construction to address environmental and economic concerns. Recycling is the act of processing the used material for use in creating new product. Stone waste i.e. Marble and Granite waste has been commonly used as building materials.

1.1 Marble Dust

Today industry's disposal of stone waste is one of the environmental problems around the world. Stones are cut into smaller blocks in order to give them the desired shape and size. During the process of cutting, the original stone mass is lost by about 30% in the form of solid as well as powder form as dust. The waste is dumped in nearby pits and vacant spaces. This leads to serious environmental pollution an occupation of vast area of land. So it poses a severe threat on the environment, eco-system and the health of the people. So it is necessary to use this stone waste in construction industry. Marble processing units produce a huge amount of Marble waste in the form of powder during Marble cutting operations. This waste is rarely degradable and causes serious environmental issues. Marble industries dump marble waste in open fields or pits which causes water logging problems and reduces porosity of soils.

1.2 Environmental Problem Associated With Marble Dust:

The following are the main problems associated with marble waste disposal:

1. At the point when dried, the fine particles cause extreme air contamination and may bring about air born infections and diseases, lungs related silicosis are caused.

2. The plenty of marble dust acquire massive land areas and after being dumped on land, it reduces the fertility of the soil due to increasing its alkalinity, decreased porosity, water absorption, water percolation etc. Hence slurry dumped areas cannot support any vegetation and remain degraded.

3. The waste along these lines dumped dries out and the fine granite dust suspends noticeable all around and is gradually showered out through wind to the close-by territory. It settles down on crops and vegetation, hence seriously debilitating the nature and severely threatening the ecology of the marble clusters.

4. The porosity and penetrability for the topsoil is decreased enormously and at the time it brings about water logging issues at the surface and in this way not permitting the water to permeate down. At the point when and where it has happened the ground water level has unfavorably been influenced and it has gone down to more profound levels. Also, the heaps of dust remain scattered all round the industrial estate are an eye sore and spoil aesthetics of entire region. In this way tourism and industrial potential of the state is unfavorably influenced.

2. LITREATURE REVIEW

1) **Kursat, Esat, Alyamac and Ragip Ince (2009)** designed the preliminary concrete mix for self-compacting concrete with marble dust. The marble has been commonly used as a building material since ancient times. Disposal of the waste materials in the marble industry consisting of very fine powders is one of the environmental problems worldwide today. The aim of this study is to find some relationship between properties of the fresh SCC and the hardened SCC containing marble powder. For this purpose, the mix design approach based on monogram developed by Monteiro and co-workers for normal vibrated concrete was adapted to SCC mixes.

2) **Felix Kala and Partheepan (2010)** examined the possibility of using granite powder as replacement of sand and partial replacement of cement with fly ash, silica fume, slag and super plasticizer in concrete. The percentage of marble powder added by weight was 0%, 25%, 50%, 75% and 100% as a replacement of sand used in concrete and cement was replaced with 7.5% silica fume, 10% fly ash, 10% slag and 1% super plasticizer. The test results obtained indicate that marble powder of marginal quantity as partial sand replacement has a beneficial effect on the mechanical properties such as compressive strength, split tensile strength, modulus of elasticity and also considerable advantages in plastic and drying shrinkage.

3) **Mucteba Uysal et al. (2012)** experimentally investigated the effect of mineral admixtures on mechanical properties, chloride ion permeability and impermeability of self-compacting concrete. The objective of this study was to evaluate the effectiveness of various mineral admixtures in producing Self-Compacting Concrete (SCC). For this purpose, Fly Ash (FA), Granulated Blast Furnace Slag (GBFS), Limestone Powder (LP), Basalt Powder (BP) and Marble Powder (MP) were used. Test results indicated that SCC could be obtained with not only LP, which the most common filler material in SCC applications but also BP and MP as filler materials. Replacing 20 % of Portland Cement (PC) with GBFS resulted in strength of more than 78 MPa at 28 days. Furthermore, the best resistance to chloride ion permeability was obtained from a combination of 60 % GBFS with 40% PC.

4) **Patel et al. (2013)** studied the possibility of using stone slurry waste as replacement of Pozzolana Portland Cement in the range of 5%, 10%, 30%, 40% and 50% by weight for M 25 grade concrete. They reported that stone waste of marginal quantity as partial replacement to the cement had beneficial effect on the mechanical properties such as compressive strength values for 7, 14, 28 days were decreased.

5) **Amudhavalli et al.(2012)** concluded the performance of concrete made with stone slurry as the partial replacement of cement. Cement was replaced with in steps of 0%, 5%, 10%, 15% and 20% by weight by M35 mix. The sample made were tested for compressive strength, split tensile strength and flexural strength at age of 7 days and 28 days. The results indicated that use of stone slurry in concrete has improved the performance of concrete in strength and durability aspects.

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