A REVIEW STUDY ON THE USE OF WASTE CERAMIC MATERIAL, EGG SHELL POWDER AND IRON SLAG IN SELF COMPACTED CONCRETE

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Abstract: Now days, Climate change is major international issue. It is the time when governments and consumers have to respond through more environment friendly products and policies. Demand of construction material is increasing day by day and due to which degradation of environment occurs. It is a prime time to explore alternative sustainable construction material from industrial as well as domestic waste. The utilization of waste materials such as slag, fly ash, glass, plastic etc. in concrete manufacturing is significant due to its engineering, environmental, ecological and economic benefits. Thus to achieve the goal of sustainable construction utilization of waste material in concrete is very much helpful. So, this study intends to use of waste ceramic tile aggregates as an alternative material of coarse aggregates in concrete production. This paper presents an review study on the properties and on the durability of concrete containing ceramic wastes, Egg shell powder and iron slag.

Keywords: Compressive strength, waste material, waste ceramic material, egg shell powder and iron slag.

1.1 INTRODUCTION

Advancement in construction is blasting businesses all over the world. Working of more noteworthy statures has wind up the dashing rivalries among countries. Concrete is one of the significant segments plays an imperative part in fulfilling this procedure. Concrete is composite material made out of aggregates, cement and water [2]. Concrete is a composite material which has generally high strength properties, however altogether bring down elasticity. Starting at 2001, the generation of Portland bond contributed 7% to worldwide CO2 discharge, to a great extent because of the sintering of limestone and earth at 1500°C. The CO2 emanation of cement is straightforwardly relative to the bond content utilized in the solid blend. Concrete make contributes ozone harming substances both straightforwardly through the creation of carbon dioxide when calcium carbonate is thermally deteriorated, delivering lime and carbon dioxide and furthermore using vitality, especially from the ignition of petroleum derivatives. There is a developing enthusiasm for diminishing carbon discharge identified with concrete generation from both scholarly and modern areas. Reusing of waste parts adds to vitality reserve funds in cement creation, to preservation of normal assets furthermore, to security of the earth. Thus, at present, the whole development industry is

looking for a reasonable and powerful waste item that would impressively limit the utilization of cement and eventually lessen the development cost [3].

Mechanical waste is the waste created by modern movement which incorporates any material that is rendered pointless amid a fabricating procedure, for example, that of industrial facilities, mills and mines. It has existed since the start of the mechanical insurgency. As of late, unique consideration has been dedicated to mechanical segments that are wellsprings of contamination of the condition. The business creates extensive volumes of strong wastes, for example, Micro silica, Egg shell powder, Fly ash end up in rivers, lakes and coastal waters. The transfer of these squanders is a vital issue, which can make hazard general wellbeing, sullying of water assets and contaminating the earth [4].

1.2 LITERATURE REVIEW ON WASTE CERAMIC MATERIAL, EGG SHELL POWDER AND IRON SLAG

Amarnath Yerramala studied the Properties of concrete with eggshell powder as cement replacement. This paper portrays investigation into utilization of poultry waste in concrete through the advancement of concrete fusing eggshell powder (ESP). Diverse ESP concretes were created by supplanting 5-15% of ESP for cement. The outcomes showed that ESP can effectively be utilized as incomplete substitution of concrete in concrete creation. The information introduced cover quality improvement and transport properties. Regarding the outcomes, at 5% ESP substitution the strength were higher than control concrete and show that 5% ESP is an ideal substance for greatest strength. Also, the execution of ESP cements was practically identical up to 10% ESP substitution as far as transport properties with control concrete. The outcomes additionally demonstrate that option of fly ash remains alongside ESP is helpful for moved forward execution of concretes. (1)

Meenakshi Dixit et al studied the Effect of Using Egg Shell Powder and Micro silica partially in Place of Cement in M25 Concrete. This study consider intends to examine the suitability of egg shell powder as fractional substitution for cement (OPC 43) in the generation of minimal effort and light weight concrete .This examination explores the execution of concrete mix regarding Compressive strength for 7 days and 28 days, Flexural strength of beam 28 days and Splitting tensile strength of cylinder for 28 days individually of M-25 review concrete at different substitution levels of OPC by Egg shell powder and a specific level of micro silica as by weight of cement. Water-binder proportion was kept consistent for all cases. These Concrete examples were cured in water under ordinary barometrical temperature. On the premise of result that halfway substitution of bond in M- 25 concrete from Egg shell powder and Micro silica was found to increment in all strength (Compressive, Flexural and Splitting Tensile strength) and durability of variety mix of concrete on all age when contrasted with normal concrete. (2)

Jayasankar.R et al did the experimental study on Concrete using Fly Ash, Rice Husk Ash and Egg Shell Powder. In this study, Ordinary Portland cement on forming to IS: 8112, 43 grade, Dalmia brand was used. Screened river sand with fineness modulus equal to 2.6 conforming to grading zone III of IS: 3831970 was used. Well graded blue granite stone aggregate passing through 12mm and retained in 4.75mm sieve with

fineness modulus of 7.48 was used. Fly ash procured from Neyveli Lignite Corporation, Neyveli, Tamil nadu India was sieved before used. Egg shells procured from local centers was grinded, sieved before used. Rice Husk Ash procured from local agricultural lands and flower mills was incinerated, cleaned and sieved before used. Based on the results of these works it can be concluded that RHA, Fly ash and ESP mixed cubes has equal strength with that of conventional concrete cubes in certain categories. M20 and M25 cubes takes equal load compared to conventional concrete and M30 grade concrete's load carrying capacity is slightly decreased. (3)

Er. Varinder Singh et al did the Physical & Analytical Investigation of Concrete with Replacement of Cement with Egg Shell Powder & Coal Powder Ash. The mix of Coal Powder Ash and Egg Shell Powder were utilized as fractional substitution of cement in concrete structures. In this examine, egg shell powder from 0% to 10% in products of 2.5% and coal powder ash from 0% to 5% in products of 1.25%. The results demonstrated that there was increment in the Compressive strength, flexural and tensile strength of the examples containing 11.25% egg shell powder and coal powder ash remains when contrasted with the control mix. Workability of concrete mix diminishes with increment in the egg shell and coal powder slag content. The diagnostic outcome from ANSYS was acquired by the results got from the exploratory work and results were confirmed. (4)

Ashif M. Qureshi et al studied the Innovative use of Rice Husk Ash Fly Ash and Egg Shell Powder in Concrete. In this investigation, Tests were done according to following codes of Bureau of Indian Standards. The test for compressive quality on shapes were estimated at 7, 14 and 28 days of restoring according to IS : 516 1959, test for flexural quality on pillar was estimated at 28 days of relieving according to May be: 516 1959 and test for split rigidity on chamber was estimated at 28 days of restoring according to IS : 5816 1999. Solid block of 150 x 150 x 150 mm measurements were projected for testing compressive quality. Vibration was given to the molds utilizing table vibrator. Following 24 hours the 3D squares put in restoring tank for 7, 14 and 28 days relieving. In the wake of restoring these solid shapes were tried on advanced pressure testing machine according to I.S. 516-1959. (5)

Niya Eldhose et al studied on Strength of Concrete by Partial Replacement of Cement by Egg Shell Powder and Aggregates by Crumb Rubber. The examination was done to assess the properties of concrete by supplanting the cement by Egg Shell Powder (ESP) and fine total by Crumb Rubber (CR) by shifting the rates of ESP (5%, 10%, and 15%) and CR (2.5%, 5%, 7.5%, 10%). A correlation of in part supplanted concrete with regular cement was likewise incorporated into the examination. Correlation of weights of Natural Concrete with mostly supplanted concrete after 28 days of curing was also carried out. The mix designs landed for a M30 mix. New properties including Slump cone test and Compaction factor test were done for both ordinary concrete and mostly supplanted concrete. Solidified properties of concrete like

Compressive Strength, Flexural Strength and Split Tensile Strength tests were completed for customary cement and partially supplanted concrete. (6)

Shaik Akhil Mastan et al did the Experimental Study on Concrete by Partial Replacement of Fine Aggregate with Fly Ash and Egg Shell Powder. This trial think about plans to examine the reasonableness of fly ash and egg shell powder as fractional trade for fine aggregate in the creation of low cost and light weight concrete. In this trial think about is an endeavor to locate the ideal use of fly ash and egg shell powder in typical cement by supplanting the river sand (7%, 14%, 21%, 28% and 35%) by weight at different extents. Tests are conducted on concrete cubes, cylinders and flexural beams to study compressive strength, split tensile strength and flexural strength. Tests are conducted for finding the strength of the concrete in 7 days and 28 days strength. Finally the results are compared with the normal conventional concrete. The weight reduction is also calculated. The suitability of the fly ash and egg shell powder concrete is evaluated. (7)

Athul Krishna K R studied on the optimum replacement of marble chips and marble dust as aggregates in m20 concrete. The fundamental objective of this investigation is to show the likelihood of utilizing marble waste as a substitute as opposed to natural aggregates in concrete production. The paper introduces the investigation strategy, the portrayal of waste marble aggregates and different functional details of cement. This test examination was done on three arrangements of concrete mixtures: Fine aggregate substitution mixture and course aggregate substitution mixture. The solid plans were delivered with a steady water/cement proportion. (8)

Mr. Ranjan Kumar et al studied the "Partial Replacement of Cement with Marble Dust Powder", in this experimental study; the impact of MDP in concrete on quality is introduced. Five concrete mixtures containing 0%, 5%, 10%, and 20% MDP as concrete substitution by weight premise has been readied. Water/cement proportion (0.43) was kept steady, in all the concrete. Compressive strength, split tensile strength & flexural strength of the concrete mixtures has been obtained at 7 and 28 days. The aftereffects of the research facility work demonstrated that supplanting of cement with MDP increment, up to 10% for compressive strength, and up to 15% for split tensile strength & flexural strength of concrete. (9)

Manju Pawar et.al has been led on Periodic Research, The Significance of Partial supplanting of Cement with Waste Marble Powder. They found that the impact of utilizing marble powder as constituents of fines in mortar or cement by somewhat decreasing amounts of concrete has been concentrated regarding the relative compressive, elastic just as flexural qualities. Fractional substitution of concrete by shifting level of marble powder uncovers that expanded waste marble powder (WMP) proportion bring about expanded qualities of the mortar and solid .Leaving the waste materials to the climate legitimately can cause natural issue. Consequently the outcome, The Compressive quality of Concrete are expanded with expansion of waste marble Powder up to12.5 % supplant by weight of concrete and further any expansion of WMP the compressive quality declines. The Tensile quality of Concrete are expanded with expansion of waste marble powder up to 12.5 % supplant by weight of concrete and further any expansion of WMP the Tensile quality

abatements. Subsequently they discovered the ideal rate for supplanting of MDP with concrete and it is practically 12.5 % concrete for both compressive and rigidity. (10)

Hameed considered consequence of squashed stone residue as fine sand and set up the flexural quality upsurges than the solid with expected sand however the norms drops as count of processor dust increments. It has existed portrayed by Reddy and Reddy, 2007 from their new modification on utilization of rock stream and protector clay scrap in solid that the stone stream when leftover as fine total increases the modulus of joy so the flexural quality. From the homework of green solid take holding quarry solid residue and marble grime buildup it has been affirmed that the split rigidity of green cement was 14.62% higher at 7 days and 8.66% higher at 28 days. In any case, part elasticity stayed start to be lesser by 10.41% at 3 days than estimated concrete. He additionally announced the clash of green cement containing smasher dust counter to sulfate assault (MgSo4 and NA2SO4) is perplexing than the square concrete. Likewise they have detailed corrosive obstruction (H2SO4) is higher than the straight concrete. The strength of quarry rock dust concrete in sulfate corrosive activity is higher than the conventionalist concrete. Similarly water makes to be included the solid containing smasher dust. The total usefulness estimation of quarry rock dust concrete as far as droop just as compaction was less as opposed to traditional concrete(Ilangovana et.al 2008). As detailed by (Hameed and Sekar. 2009) the droop esteem rises (Workability increments), if concrete is blended in with quarry dust as fit as marble ooze because of quality of marble slop powder. **(11)**

Mohamed Ansari M et al did the experimental investigation on Replacement of Cement using Eggshell Powder. The study shows the effect and experimental result of replacement of eggshell powder in cement. The compressive test was carried out for concrete replaced with 10%, 15% and 20% of eggshell powder in Portland pozzolona cement. The compressive strength was tested for concrete cubes of dimension 150 x 150 x 150 mm. The test was carried in compressive test machine of capacity 100KN. In compressive strength test the loading rate was 50KN/s. The compressive test was conducted on 150mm cube specimens at 7thday and also to be done on 28th day. The results which came after carrying out all tests found successful which indicates that eggshell powder can be used as a replacement material for cement. From the results it is proved that replacement of eggshell powder if about 10 % to 15 % is effective and when we increasing further the percentage of eggshell powder decrease the compressive strength [12].

Praveen Kumar R et al did the experimental study on the Partial Replacement of Cement with Egg Shell Powder. In this study, a combination of Egg shell with silica fumes are used in different combinations to find the feasibility of using the Egg shells as an alternate to cement Egg shell powder replaces 10%, 20% and 30% in addition with the silica fume by 5%, 10%, 15% of weight of cement. Concrete is cast and Compressive test, Tensile and Flexural tests were carried out to find the best combination which results in optimum percentage of strength. The point of this investigation is to examine the concoction organization of the egg shell to discover its appropriateness of substitution in the concrete. To look at the achievability of using the egg shell and silica rage as cement substitution material. To think about the quality parameters of

the egg shell powder mix examples and to contrast it and ordinary examples. The extent of the investigation is to cast the concrete samples and direct the compressive strength test, split tensile strength test and flexural strength test at seventh and 28th day, with the predetermined mixes of egg shell powder and contrast it and the controlled concrete samples. In this venture M30 Concrete is intended for different mixes [13].

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CONCLUSION

Following are the various conclusions drawn after review study of concrete by using waste ceramic material, egg shell powder and iron slag:

1. The literature study concludes that the flexural strength and compressive strength increases with waste ceramic material, egg shell powder and iron slag in concrete.
2. With the increase in waste ceramic material, egg shell powder and iron slag in concrete, the workability of concrete also increases.
3. The cost of forming concrete can be reduced by using waste ceramic material, egg shell powder and iron slag in it.
4. By using waste ceramic material, egg shell powder and iron slag, we can make environment more sustainable.

5. The compressive strength10f concrete increases by the addition of waste ceramic material, egg shell powder and iron slag in concrete.
6. The split tensile strength of concrete increases by the addition of waste ceramic material, egg shell powder and iron slag.
7. The Flexural strength of concrete increases by the addition of waste ceramic material, egg shell powder and iron slag.

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