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EXPERIMENTAL STUDY ON THE BEHAVIOR OFCONCRETE BY REPLACEMENT OF FINE AGGREGATE WITH GRANITE POWDER AND CEMENT WITH ALCCOFINE 1203- A REVIEW

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Abstract:- **Granite fines which are the by-product produced in granite factories while cutting huge granite rocks to the desired shapes, while cutting the granite rocks, the powder produced is carried by the water and this water is stored in tanks. After drained of water the granite dust remained is disposed on the lands. Disposing this granite fines is a major problem due its fineness. Hence an effect is made to utilize this fine granite powder in asa filler material in concrete. A new ultra-fine material emerged in market is called alccofine. This is available as a cementious material for replacing cement. Since this a new material, a study is tried out with the combination of Alccofine. For the basic properties of replacement of fine aggregate with 10% of Granite Powder and varying percentages of Alccofine 5%, 10%, 15%, 20% and 25% with replacement of cement. The results shows that as the Replacement of Fine Aggregate with Granite Powder and Cement with Alccofine increases slump decreases, addition of Granite Powder slightly increases internal particle friction which results in reduction of slump value. Rather the decrease of slump still lies in the range of 50-75 mm. As the percentage of Alccofine increases, the compressive strength of specimens also increases upto some extent. Mix material with 10% GP and 15% Alccofine has the optimum value of compressive strength. Afterward the compressive strength decreases gradually. As the percentage of Alccofine increases the split tensile strength of specimens also increases upto some extent. Mix material with 10% GP and 15% Alccofine has the optimum value of split tensile strength. Afterward the compressive strength decreases gradually.**

IndexTerms – Granite Powder, Alccofine, Fine, Aggregate, Expensive Soil, Waste Material

I. INTRODUCTION

Fine aggregate is an essential component of concrete. The most commonly used fine aggregateis natural river sand. The global consumption of natural river sand is very high due to the extensive use of concrete. In particular, the demand of natural river sand is quite high in developed countries owing to infrastructural growth. Concrete is the most widely used man made construction material in the world. It is obtained by mixing cement materials, water and aggregates, and sometimes admixtures in required proportions. Concrete is generally classified as a normal strength concrete, high strength concrete and ultra- high strength concrete etc. As per Indian standard a recommended method of mix design denotes the boundary of 35Mpa between Normal strength concrete and high strength concrete but as per international forum, the high strength concrete label was applied to concrete having strength above 40MPa. Now it have been rose to 55MPa as per IS 456-2000. Granitic rocks are classified according to the QAPF diagram for coarse grained plutonic rocks and are named according to the percentage of quartz, alkali feldspar (orthoclase, sanidine, or microcline) and plagioclase feldspar on the A-Q-P half of the diagram. True granite (according to modern petrologic convention) contains between 20% and 60% quartz by volume, with 35% to 90% of the total feldspar consisting of alkali feldspar. Granitic rocks poorer in quartz are classified as syenites or monzonites, while granitic rocks dominated by plagioclase are classified as granodiorites or tonalites. Granitic rocks with over 90% alkali feldspar are classified as alkali feldspar granites. Granitic rock with more than 60% quartz, which is uncommon, is classified simply as quartz-rich granitoid or, if composed almost entirely of quartz, as quartzolite. Alccofine-1203 is a micro fine additive for Concrete & Mortars. Alccofine-1203 provides innovative solutions to improve the performance of Concrete many folds without increasing the cost. Few of these concretes are High Strength, Precast, High Rise, Long distance pump-able. Alccofine 1203 performs in superior manner than all other mineral admixtures used in concrete within India. Due to its inbuilt CaO content, ALLCOFINE 1203 triggers two way reactions during hydration. ALCCOFINE also consumes by product calcium hydroxidefrom the hydration of cement to form additional C-S-H gel, similar to pozzolans.

II. LITERATURE SURVEY

Lalit Gamashta *et. al*. **(2006) [1]** investigated that the demolition, repair and renewal ofconcrete and masonry structure was rising all over the world, more so in the developing countries and the waste materials of concrete and bricks are further reutilized after the demolition of old structure in an effective manner especially realizing that it was help in reducing the environmental damages caused by excessive reckless quarrying for earth materials and stones. Secondly, this was reduce pressure on finding new dumping ground for these wastes,thus further saving the natural environment and eco-system. The authors also examines the properties in reused

concrete and bricks masonry waste materials and suggests suitable recommendation for further enhancing life of such structure, thereby resulting in sufficient economy to the cost of building. **Kanmalai Williams** *et al.* **(2008) [2]** reported the results of an experimental study on the high performance concrete made with granite powder as fine aggregate. The percentage of granite powder added by weight a range viz. 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 effects of curing temperature at 32 Sand 0.40 water-to-binder (w/b) ratio for 1, 7, 14, 28, 56 and 90 days on compressive strength, split tensile strength, modulus of elasticity, drying shrinkage and water penetration of concrete were studied. Their results indicated that the increase in the proportions of granite powder resulted in a decrease in the compressive strength of concrete. The highest compressive strength was achieved in samples containing 25% granite powder concrete, which was 47.35 kPa after 90 days. The overall test performance revealed that granite powder can be utilized as a partial replacement of natural sand in high performance concrete. **B.Vidivelli** *et. al.* **(2010) [5]** investigated that the Increasing performance of concrete with the partial replacement of mineral admixture using flyash along with chemical admixtures eliminates these drawbacks besides enhancing durability characteristics. The authors also investigated that the concrete with partial replacement of cement by flyash. Concrete mixes, viz. Conventional concrete mixes with varying percentages of flyash (10, 20, 30 and 40%) as cement replacement material were investigated. The compressive strength, tensile strength of cubes and cylinders and flexural strength test were carried out on 4 concrete mixes at the ages of 28, 45, 60, 90 and 180 days. The authors concluded that the 20% neyvelli flyash could be incorporated as cement replacement in concrete. Since the concrete specimens containing 10% and 20% flyash were examined by scanning electron microscopy (SEM) represent dense microstructure which increases the strength in concrete. **Mr. G. Raja and Mr. K. M. Ramalingam (2016) [11]** investigated that the cubes were casted with 7 different proportions of granite fines and fine aggregate and the replacement percentage of granite fines to fine aggregate were 0, 10, 20, 30, 40, 50 and 100 for M20 mix proportions, specimens were tested after 28 days of curing, for compression strength, flexural and split tensile strength for the specimen casted with 40 % replacement of granite fines to fine aggregate gives higher strength when compared to control specimen. **S. Arulkesavan** *et al.* **(2017) [12]** evaluated that the Concrete were prepared with granite finesas a partial replacement of fine aggregate in different proportions namely 10%, 15%, and 20% and the various tests to be conducted on concrete such as compressive strength split tensile strength and flexural strength. The tests values are computed and compared with the conventional concrete. The Author concluded that the specimen cast with 10% replacement of fine aggregate by granite fines gives better compressive strength of 1.06% increased, Split tensile strength of 1.11% increased and Flexural strength of

1.14% increased and the specimen cast with 15% replacement of fine aggregate by granite fines gives better compressive strength of 1.03% increased, Split tensile strength of 1.08% increased and Flexural strength of 1.01% increased .When to compare to conventional concrete. **B. Kavya** *et. al.* **(2017) [13]** investigated that the Alccofine 1203 was a specially processed product based on high glass content with high reactivity and Concrete attains high strength at a very early age, due to the presence of alccofine material. The Authors also investigated that the Alccofine as a supplementary cementing material and filling material on the strength of concrete. The authors concluded that the maximum compressive strength of concrete was achieved by using Alccofine 15% and the addition of Alccofine increases the self-compatibility characteristics like filling ability, passing ability and resistance to segregation. **K. Mohammed javid** *et. al.* **(2018) [14]** investigated that the Granite waste was an industrial waste which was obtained from the Granite Polishing industry in an powder or an Stone form and these waste were easily carried out by air and hence cause serious problem to the human health. The authors evaluated that the M20 Grade of Concrete was performed and replace with fine aggregate by granite powder with four different percentages of 20%, 40%, 60% and 80%. The authors concluded that the strength was increased with partial replacement of fine aggregateby granite powder and compressive strength test results 7 Days, 28 Days and 90 Days which increased gradually at replacement of granite powder upto 40% and slightly decreased at 60% and also in Split tensile strength test. **Sanjeev Sehgal and Pratiksha Malviya (2019) [15]** investigated that the Granite powder wasto be used as partial replacement of the natural sand and the used of Granite powder in concrete was beneficial in different manner such as environmental aspects, non-availability of good quality of fine aggregate or rarely availability, strength quality etc. **Suganya R and Lathamaheswari R (2019) [16]** investigated that the presence of alccofine in the conventional concrete in optimum dosage can expected to improve the strength of concrete and provide resistance against chloride attack, sea water attack and accelerated corrosion attack and the cement replacement mainly for two reasons, to stabilize the scarcity of cement and improve the properties of concrete in their life cycle. The Authors also investigated that the strength of concrete by the partial replacement of cement with alccofine and full replacement of sand by manufactured sand. The authors Experiments on concrete by replacing cement with alccofine on varying percentage such as 0%, 5%, 10%, 15%, 20% and 25% for 7, 14 and 28 days. The Authors concluded that the compressive strength of the concrete get increased when the cement was partially replaced with alccofine up to 15% and gradually decreases by increasing the percentage of alccofine and the highest compressive strength is achieved at 15% replacement of alccofine and 100% replacement of manufactured sand in concrete. **Balamuralikrishnan R. and Saravanan J. (2019) [17]** investigated that the Ordinary Portland Cement 53 grade was used throughout the study and the grade of concrete was M20. Totally

108cubes and 27 cylinder were cast and tested in the laboratory with nine different percentage combination of alccofine (A), GGBS (G) and cement (C) (C100, C70A0G30, C90A10G0, C60A10G30, C30A10G30, C40A0G60, C85A15G0, C55A15G30, C25A15G60). Each case 3 nos. of specimen were used for repeatability and the compressive strength, and its durability properties like acid attack test, sulphate attack test and rapid chloride permeability test (RCPT). Among the nine different combinations the maximum compressive strength of concrete was achieved by using AL10% and GGBS 30% was 38.08 N/mm^2. C60A10G30 was 28.76% higher than the control mix. The Authors concluded that the concrete incorporating alccofine and GGBS have higher compressive strength and alccofine enhanced the durability of concrete also. The Authors also concluded that the compressive strength of concrete was achieved by using AL10% and GGBS 30% was 38.08 N/mm^2. C60A10G30 was 28.76% higher than the control mix and the minimum losses of weight and loss of compressive strength was achieved by C60A10G30 mix for acid attack test, sulphate attack test and chloride attack test. From the acid attack test results, loss of compressive strength was 28.76% was lower than the c/c and mass loss was 4.987% was lower than c/c. From the sulphate attack test results, loss of compressive strength was 23.41 % was lower than the c/c and mass loss was 0.61% was lower than c/c. From the chloride attack test results, loss of compressive strength was 22.91% was lower than the c/c and mass loss was 1.02% was lower than c/c. **Revati P** *et. al.* **(2019) [18]** investigated that the use of alccofine and MDP in a combination as supplementary cementetious material (SCM) by partially replacing cement in concrete can be a leading step towards sustainable development of concrete industry. Comparing and examining the physical properties of this new modified concrete with conventional concrete. The Authors concluded that the Marble dust powder and alccofine can be used in a combination as supplementary cementitious material as partial replacement of cement with 15% alccofine with 15% marble dust powder (K1) gives 32% increase in compressive strength of this newly modified concrete in comparison with conventional concrete of M40 grade which was optimum amongst other combinations. The Authors also concluded that the 15% alccofine with 15% marble dust powder (K1) gives satisfactory results in flexural strength and split tensile strength for this modified concrete and Percentage increase in MDP results in decrease of strength parameters i.e. combination having 20%, 25%, 30% of MDP gives less increase in results for this mix proportion. **Anandhu Ramesh** *et al.* **(2019) [19]** investigated that the suitability of granite powder by- product as a substituent material for fine/natural aggregate in concrete production and the physical and Chemical characterization of the GP by-product as well. The Authors investigated that the cubes were prepared by 0%,10%,15%,20% of fine/natural aggregate substation GP by- product on behaviur of concrete, compressive strength on cubes are perform. The Authors Concluded that the compressive strength and axial stress strain behaviour of the substition rate upto

20% was fairly greater than values obtained with natural aggregates and it was suggested that substition of natural aggregates by GP by-product upto 20% is favourable for the concrete resistance. Compressive strength of HPC shows increasing trend till 15% increment of granite powder and again it was very near to the conventional concrete. The workability of concrete was good even after addition of the granite powder as replacement into concrete. **Vaibhav Vivek Patil and V. S. Shingade (2020) [20]** investigated that the mechanical properties of concrete was studied by replacing cement with GGBS and addition of Alccofine with different weight fractions with respect to cement. Alccofine was used, the research was carried out by using M20 grade concrete with replacement of 2.5%,5%,7.5%,10%, Alccofine by keeping marble dust as 5%,7.5%,10%,12% constant and was carried out to determine theoptimum percentage of replacement at which maximum C S, F S is achieved, the properties of the material are analyzed. The Author concluded that the compressive strength increased with increase of marble powder up to 10% replacement and it was observed that 2.81%, 2.92% and 4.58% of strength increased compared to normal mix with 10% replacement of marble powder at 7, 28 and 56daysrespectively. The author also concluded that 0.43%, 11.6% and 5.6% of spilt tensile strength increased at 10% of marble powder compared to normal mix at 7, 28 and 56days respectively and it was noticed that 11.22%, 20% and 14.8% of flexural strength increased at 10% replacement of marble powder comparedto normal mix at 7, 28 and 56days respectively. Considerable reduction in strength was observed at 15% and 20% replacement of marble powder. For compressive strength, spilt tensile strength and flexural strength 10% replacement with marble powder was found to be a best alternative for replacement as increased in percentage of strength is high compared to other variations in the mix.

III. CONCLUSIONS

Test result shows that as the Replacement of Fine Aggregate with Granite Powder and Cement with Alccofine increases slump decreases, addition of Granite Powder slightly increases internal particle friction which results in reduction of slump value. Rather the decrease of slump still lies in the range of 50-75 mm. As the percentage of Alccofine increases, the compressive strength and split tensile strength of specimens also increases upto some extent. Addition of Granite Powder and Alccpfine-1203 has the positive effect on residual compressive strength.

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