

Review On Investigate the Effect on Concrete by the Partial Replacement of Fine Aggregate with Granite Powder

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ABSTRACT: Granite is an igneous rock which is widely used as construction material in different forms. Granite industries produce lot of dust and waste materials. The wastes from the granite polishing units are being disposed to environment which cause health hazard. This granite powder waste can be utilized for the preparation of concrete as partial replacement of sand. In order to explore the possibility of utilizing the granite powder as partial replacement to sand, an experimental investigation has been carried out. The percentages of granite powder added by weight to replace sand by weight were (0%, 5%, 10%, 15%, 20% and 25%) and various tests such as compressive strength, Split tensile strength and Flexural strength are investigated and these values are compared with the conventional concrete without granite fines. Standard cube of 150X150X150mm will be cast and tested for obtaining 28-day compressive strength. Standard cylinder of 150mm diameter and 300mm height will be cast and tested for split tensile strength. Standard beam of 500X100X100 will be cast and tested for flexural strength. Then analyze all the result mathematically and graphically.

KEYWORDS: Granite Powder, Compressive strength, Split tensile strength, Flexural strength.

I. INTRODUCTION

Fine aggregate is an essential component of concrete. The most commonly used fine aggregate is 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. The non-availability of sufficient quantity of ordinary river sand for making cement concrete is affecting the growth of construction industry in many parts of the country. Recently, Tamil Nadu government (India) has imposed restrictions on sand removal from the river beds due to its undesirable impact on the environment. On the other hand, the granite waste generated by the industry has accumulated over years. Only in significant quantity has been utilized and the rest has been dumped unscrupulously resulting in pollution problems. With the enormous increase in the quantity of waste needing disposal, acute shortage of dumping sites, sharp increase in the transportation and dumping costs necessitate the need for effective utilisation of this waste. There sent work is aimed at developing a concrete using the granite scrap, an industrial waste as a replacement material for the fine aggregate. By doing so, the objective of reduction of cost of construction can be met and it will also help to overcome the problem associated with its disposal including the environmental problems of the region. Accordingly this project work will examine M25 grades of concrete were cast by varying the percentage replacement of sand with granite powder.

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II. REVIEW OF LITERATURE

Dr. G. Prince Arul raj et al studied on “GRANITE POWDER CONCRETE” in this study they founded that the cured specimens were allowed to dry in air. The dried specimens were centred on a compression testing machine of capacity 2000 KN. The load was applied at a uniform rate of 14 KN/mm²/min. Split tensile strength of concrete is usually found by testing plain concrete cylinders. Cylinders of size 150mm x300 mm were used to determine the split tensile strength. After curing, the specimens were tested for split tensile strength using a calibrated compression testing machine of 2000kN capacity.

A ARIVUMANGAI and T FELIXKALA studied on “Fire Resistance Test on Granite Powder Concrete” in this study they founded on The compressive strength concrete mixtures at different testing ages are presented. The data presented shows that the compressive strength of all the granite powder concretes thermally treated at 70°, 140°, 210° and 280°C for 1 hour and 2 hours. It was observed that the compressive strength at 140°, 210° and 280°C for 1 hour and 2 hours. It was observed that the compressive strength of granite powder specimen increased with temperature to 70°C and then decrease to 280°C. Compressive strength of control concrete is 6 per cent higher than that at 2 hour strength and that of granite powder concrete varies from 8 to 34 per cent. Therefore granite powder concrete with admixtures contributes immensely in enhancing the compressive strength of concrete and the increase is 1.23 times that of normal concrete.

S.Vishnu Shankar and K.Saravana Raja Mohan studied on “Durability Studies on Cement Mortar with Granite Powder as A Partial Replacement of Cement” in this study they concluded on through an visual examination of corroded specimens, the granite content of 30% in the cement mortar samples had taken 72 hours for the excessive corrosion to take place, which is at an average 24% more time than the other mixes. Therefore it can be concluded that 30% replacement of cement with granite powder showed better results in terms of corrosion resistance compared to other mixes. Fire resistance test results show that the residual compressive strength of the cement mortar with granite content 30%, is higher than other mixes. Next to this level of replacement, 35 replacement showed good results.

Divakar et al studied on “Experimental Investigation on behavior of concrete with the use of Granite fines” in this study they founded on The compressive strength has increased by 22% with the use of 35% replacement of fine aggregates with granite fines. With increase of granite fines up to 50% increasing compressive strength will limit to 4% only. The split tensile strength remains same for 0%, 25% and 35%. For 5% replacement there is an increase of 2.4% of strength and for 15% replacement there is a reduction of tensile strength by 8%. However we can conclude that with the replacement of 35% granite fines the test results shows no decrease in strength compared with the conventional mix using fully sand as fine aggregates.

J. Thivya and M. Arivukkarasi studied on “Comparative Analysis on Partial Replacement of Cement by Metakaolin and Fine Aggregate by Granite Powder” in this study they founded on the The addition of Metakaolin along with cement has increased the compressive strength of the concrete when compared to the conventional concrete. The more effective percentage of replacement with Metakaolin seems to be between 10% and 15%. The mechanical properties of concrete are increased with partial replacement of Metakaolin and Granite powder. The compressive strength of concrete increased with 15% MK and 20% GP replacement in concrete.

P. L.Chowdhery et al. Studies on “Strength Properties of Effect of Waste Granite Powder on the Compressive Strength of Concrete” in this study they analyzed on the compressive strength of concrete is found to increase with increase in Granite powder content. It is found that the strength is increasing from 0 to 7.5% and decreases 7.5% to 10% for 7 and 28 days. The split tensile strength of blended concrete is found to be with the replacement of cement by Granite powder from 0 to 7.5 percent. However the split tensile strength of concrete is seen to increase with the Granite powder content and reaches an optimum value at 7.5% and afterwards gets decreased for 10% for 7 and 28 days.

M.Manikandan and Dr.T.Felixkala studies on “EXPERIMENTAL STUDY ON PROPERTIES OF GRANITE WASTE IN SELF COMPACTING HIGH PERFORMANCE REINFORCED CONCRETE BEAM” in this study they analyzed on the basis of experiments conducted on six beam specimens the following observation and conclusions are drawn. The load at failure of GP was high that controlled beam when test at 28 days its increase. The deflection under the concrete beams with 25% GP were same as the controlled beams at 28 days testing and it was quite less than controlled beams. The structural behavior of self compacting high performance reinforced concrete beams with GP resembled the typical behavior of high performance reinforced concrete beams and there increase in load carrying capacity of GP beams with age. Hence result of this investigation suggest that concrete with 25% GP replacement for fine aggregate could be used for Self compacting high performance reinforced concrete beams.

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Raghavendra R et al. studies on “Flexural strength of High Performance Concrete using Granite powder as fine aggregate” in this study they founded on the flexural strength shows increasing trend at early stages of curing even after replacing natural sand by granite powder. The later stage of curing that is 28 and 56 days let to a new increment in strength with the increase in GP% but not as much as conventional concrete. The workability is as good as conventional concrete. Hence the granite aggregates can be considered as an alternative for fine aggregates (river sand).

N. Kiran Kumar et al. studies on “An Experimental Investigation on strength of Granite-fines concrete” in this study they founded from the test results it is clearly evident that granite powder as a partial replacement of sand proves to be beneficial when mechanical properties of strength is considered. Concrete mix with 30 % addition of granite fines proves to be better when compared with other proportions. Compressive Strength, particularly in all the ages higher than reference mix (GF0), there was an increase in strength as the days of curing increases. The compressive strength with 30 % addition of granite fines yielded higher value compared with other values.

Allam M. E. et al. studies on “Influence of Using Granite Waste on the Mechanical properties of Green concrete” in this study they founded on the splitting tensile strength for mixes containing 5% of fine granite waste as a partial replacement of cement was 20% higher than the control mix. Increasing the replacement ratio of cement 10% led to a value for the splitting tensile strength equal to that measured for the control mix. However, exceeding this ratio caused drop in tensile strength measured. Replacing sand in the concrete mixes by granules granite waste with up to 25% replacement ratio led to higher values of splitting tensile strength than that obtained from the control mix.

Dr. T. Felix Kala studies on “Properties of Granite Powder Concrete” in this study they founded on an experimental study on the high performance concrete made with granite powder as fine aggregate and partial replacement of cement with 7.5 % Silica fume, 10% fly ash and 10% slag subjected to water curing is conducted for finding the mechanical properties such as compressive strength, split tensile strength, modulus of elasticity, flexural strength and water absorption characteristics of concrete mixtures. Concrete specimens were prepared with w/c ratio of 0.25, 0.30, 0.35, for M60 grade concrete mix. The test results show clearly that granite powder as a partial sand replacement has beneficial effects of the mechanical properties of high performance concrete. Of all the six mixtures considered, concrete with 25% of granite powder (GP25) was found to be superior to other percentages of granite powder concrete as well as conventional concrete and no admixtures concrete for all operating conditions. Hence the following conclusions are made based on a comparison of GP25 with the control concrete, CC.

P. Partheeban et al. studies on “Granite powder concrete” in this study they founded study on the performance concrete made with granite powder as fine aggregate and partial replacement of cement with 7.5% Silica fume, 10% fly ash, 10% slag and 1% superplasticiser subjected to water curing is conducted for finding the characteristic mechanical properties such as compressive strength, split tensile 0.40 water-cement ratio. The test results show clearly that granite powder as a partial sand replacement has beneficial effects of the mechanical properties of high performance concrete.

K.Chiranjeevi reddy et al. studies on Experimental Study on Concrete with Waste Granite Powder as an Admixture in this study they founded on the Compressive strength of concrete increases with replacement of granite powder waste for both 7 & 28 days at 7.5 % (33.14 & 43.40 N/mm²) and it is comparable to normal concrete (23.26 & 39.41 N/mm²). Split tensile strength also got increased for both 7 & 28 days at 7.5 % of replacement of cement and gave values of 2.8 & 4.19 N/mm² and it is comparable to normal concrete is 2.44 & 3.43 N/mm².

Tanveer Asif Zerdi and Safiulla mohammad studies on Strength and Durability Properties of Granite Powder Mixed Concretes in this study they founded on the Compressive load on cube sample were applied under the compression testing machine. The average of three test are taken. Result indicates that compressive strength increase gradually with addition of GPR from 10% replacement of SAND with GRP, 20 % replacement of fine aggregate with GRP and 30% of GRP with sand. Beyond this range of the proportion of GRP, compressive strength decreases. The reason in that the GRP do not combine with gel during hydration process leading to weak micro structure of concrete.

Raghavendra studies on Compressive Strength of High Performance Concrete using Granite Powder as Fine aggregate in this study they founded on the 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 is good even after addition of the granite powder as replacement into concrete.

Dilip Kumar studies on “Effect of Partial Replacement of Cement by Fly Ash and addition of Granite powder on the properties of concrete” in this study they founded on the Compressive strength of fly ash concrete up to 20% replacement level is more to referral concrete at 28 days. It was observed that at 28days in 20% replacement of OPC by fly ash and addition of granite powder, the strength increased up to 41.33 N/mm².

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Y.Yaswanth Kumar studies on “Experimental Study on Concrete with Waste Granite Powder as an Admixture” in this study they founded on the Compressive strength of concrete increases with replacement of granite powder waste for both 7 & 28 days at 7.5 % (33.14 & 43.40 N/mm²) and it is comparable to normal concrete (23.26 & 39.41 N/mm²).The workability is also very good for different percentage of replacement of cement.

Dr.G.Elangovan studies on “Experimental Study of Concrete by Partial replacement of Cement with Granite dust Powder” in this study they founded on the From the compression test results it is found that the concrete mix with 15% replacement of cement with Granite Dust Powder shows the higher compressive strength than the Reference concrete mix for both 7 days and 28 days curing. Cost analysis is the very important factor to be considered, while analyzing the experimental work. Based on the cost analysis, the cost for Reference concrete mix is Rs.5471 per m³ and for concrete mix with 15% GDP is Rs.5017 per m³ which is 8.3% less than the cost of reference mix.

Shehdeh Ghannama studies on “Sustainable Materials and Technologies” in this study they founded on the The concrete mix made using granite powder (GP) and iron powder (IP) as partial replacement of sand showed good workability and fluidity similar to normal concrete mixes. The compressive strength of concrete increased with the addition of granite powder (GP) as partial replacement of sand. Using 10% granite powder (GP) in concrete gave the best result (highest increase in compressive strength) compared to other ratios.

Bakhoum E. S. et al. studies on “RE-USE OF GRANITE SLUDGE IN PRODUCIN GREEN CONCRETE” in this study they concluded on the: 10% substitution of sand by the granite waste provided higher compressive strength compared to the control mix at all ages. 5% substitution of cement by granite waste caused a small decrease in the compressive strength (about 5-9%).

III. CONCLUSION

All the above practical based upon the additional material. Some material and its adding percent give good result to increases the strength and performance of concrete. In this work, experimental investigation will be made to understand the behaviour of concrete with partial replacement of granite powder. Workability, compressive strength, split tensile strength and flexural strengths will be analyzed and tested. Results will analyse to derive useful conclusions regarding the strength characteristics of granite powder. Tested all the sample of granite powder in different percentage which sample will be give maximum result. This experiment may be gives some intresting conclusion which is topic of analysis. The main aim to gives the high strength and high performance concrete and also have a economical for construction work.

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