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A Study on Development of Concrete Made with waste Granite Powder

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ABSTRACT

The purpose of this study is to This study will use granite refuse obtained from the construction sector in India. Much of the ceramic industry's output currently goes to waste since it has not yet been recycled. As a partial replacement of cement with M-25 grade concrete, varying percentages of granite dust (5%, 10%, 15%, and 20%) were substituted for marble dust. The time it takes for concrete to cure is 7, 14, or 28 days. According to the findings, samples of concrete with 0 to 15% granite dust substitution have reached their maximum strength. The researchers discovered that concrete with 0 to 15% marble dust had the maximum compressive strength, split tensile strength, and durability..

Keywords: - granite powder, workability, compressive strength, split tensile strength, UPV test, dynamic modulus of elasticity

1. INTRODUCTION

During the cutting and polishing of granite, waste granite powder is produced as a by-product. The waste accounts for about 20% of the total granite handled. Every year, between 250 and 400 tons of waste granite powder are generated at the plant. Concrete technological advancements can help to reduce the consumption of natural resources, energy sources, and pollution in the environment. This study investigates the viability of using granite powder as a partial replacement for cement in concrete manufacturing. Garnite processing is one of India's most thriving industries..

2. Literature reviews

Kumar et al. (2001) investigated the use of quarry dust as a partial replacement for cement. The study's main goal was to determine the maximum amount of quarry dust that might be used as a partial replacement for cement in concrete. The percentages of quarry dust partial substitution of cement in concrete are 0, 10%, 15%, 20%, 25%, 30%, 35 percent, and 40%. For the compressive strength test, M20, M30, and M40 grade concrete cubes of 150x150x150mm were cast. They discovered that replacing 25% of the cement with quarry dust improved the characteristics of hardened concrete in experimental trials.
Kavas and Olgun (2007) investigated the characteristics of cement and mortar using crushed brick and granite dust. The inclusion of granite dust (GD) at a replacement level of 8% resulted in a drop in mortar strength, according to the researchers. Incorporating GD and crushed brick (CB) in cement, on the other hand, resulted in a considerable increase in mortar strength as compared to GD mortar.

Ali and Hashmi (2009) conducted an experimental study on concrete strength characteristics using granite powder dust as a partial replacement for cement and stone dust as a partial replacement for sand. Compressive, flexural, and split tensile strengths are measured at various stages of curing in this study. Furthermore, for M30 concrete grades, sand was replaced with stone dust (SD) by 10%, 20%, and 30% by weight, while cement was substituted with MP by 0%, 10%, and 20% by weight. They found that incorporating granite dusts results in insignificant improvements in the compressive, flexural, and split tensile strengths of concrete up to 10% replacement, as well as that incorporating stone dusts and granite dust results in insignificant improvements in the compressive strengths of concrete up to 20% SD and 10% MP replacement.

3. Materials and Methodology

3.1 Cement

Ordinary Portland cement (OPC) from a single lot was used throughout the course of the investigation. The physical properties of the cement as determined from various tests 30 conforming to Indian Standard IS: 1489-1991(Part-1) are listed in Table 3.1. All the tests were carried out as per recommendations of IS: 4031-1988. Cement was carefully stored to prevent deterioration in its properties due to contact with the moisture.

3.2 Fine aggregate

Locally available river sand passed through 4.75mm IS sieve is applied as fine aggregate. The specific gravity of sand is 2.61.

3.3 Course Aggregate

The coarse aggregate with a maximum size 12.5mm having a specific gravity 2.67 and fineness modulus of 6.49%. Angular recycled aggregates from a local source were used as coarse aggregate. The specific gravity was 2.69.

3.4 Granite powder

It was sieved by IS-90 micron sieve before mixing in concrete.

3.5 Admixture

Water-reducing and set-retarding admixtures are permitted in order to increase the workability of the concrete. Super plasticizer Gelenium hky 8765 was used for the workability.

4. Result and Discussion on Experimental Tests

4.1 Workability of Concrete Mixes

Workability is considered to be that property of plastic concrete which indicates its ability to be mixed, handled, transported and most importantly, placed with a minimum loss of homogeneity. There should be no sign of any segregation or bleeding in a workable concrete. The workability of all the mixes of concrete used in this work was controlled by conducting slump test, test apparatus was shown in Fig3.1.

Table 4.1 Workability & Compaction factor values for different concrete mixes

Description	Slump (mm)
100%OPC	**109**
95%OPC+5%GP+1%	**105**
90%OPC+10%GP+1%	**101**
85%OPC+15%GP+1%	**99**
80%OPC+20%GP+1%	**96**

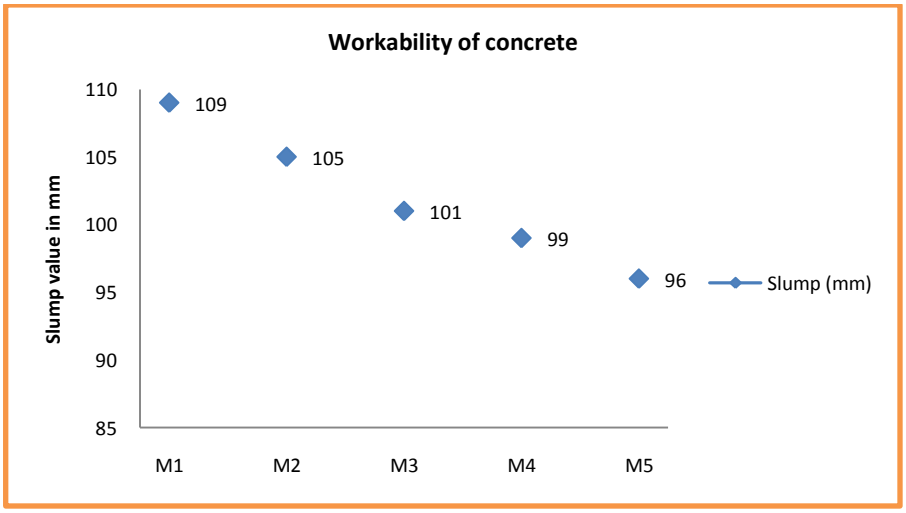


Fig. 4.1 Variation of slump value in mm

4.2 Compressive Strength

The results of the compressive strength tests conducted on concrete specimens of different mixes cured at different ages are presented and discussed in this section. The compressive strength test was conducted at curing ages of 7, 14, 28 days.

Table 4.3. Compressive strength (MPa) values of all mixes at different curing ages

Description	7 Day	14 Day	28 Days
100%OPC	28.50	29.02	32.10
95%OPC+5%GP+1%	31.10	33.20	37.80
90%OPC+10%GP+1%	33.83	34.50	39.50
85%OPC+15%GP+1%	35.05	37.33	41.90
80%OPC+20%GP+1%	31.21	35.45	38.32

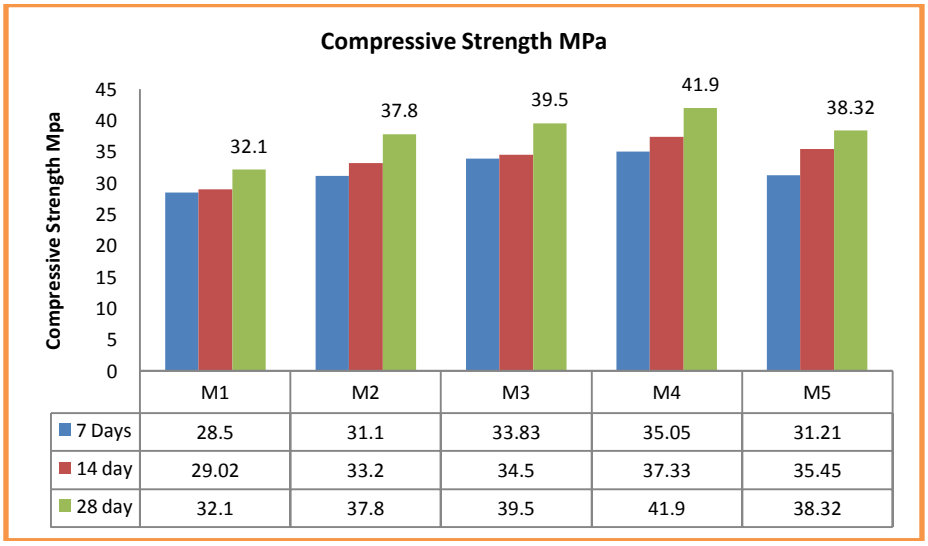


Fig. 4.1 Variation of compressive strength of concrete with age

3.3 Split Tensile Strength Test Results

The results of the splitting tensile strength tests conducted on concrete specimens of different mixes cured at different ages are presented and discussed in this section. The splitting tensile strength test was conducted at curing ages of 7, 14, 28 days.

Table 4.4. Split tensile strength test(MPa) values of all mixes at different curing ages.

Description	7 Day	14 Day	28 Days
100%OPC	3.5	3.9	4.53
95%OPC+5%WP	3.55	3.99	4.8
90%OPC+10%WP	3.9	4.1	5.1
85%OPC+15%WP	4.05	4.19	5.3
80%OPC+20%WP	3.7	3.95	4.92

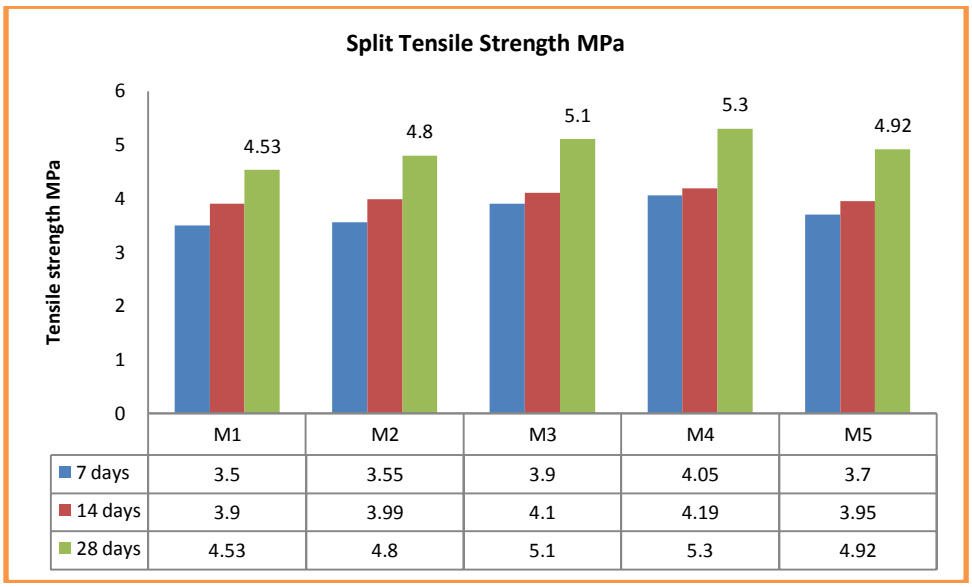


Fig. 4.2 Variation of split tensile strength of concrete with age

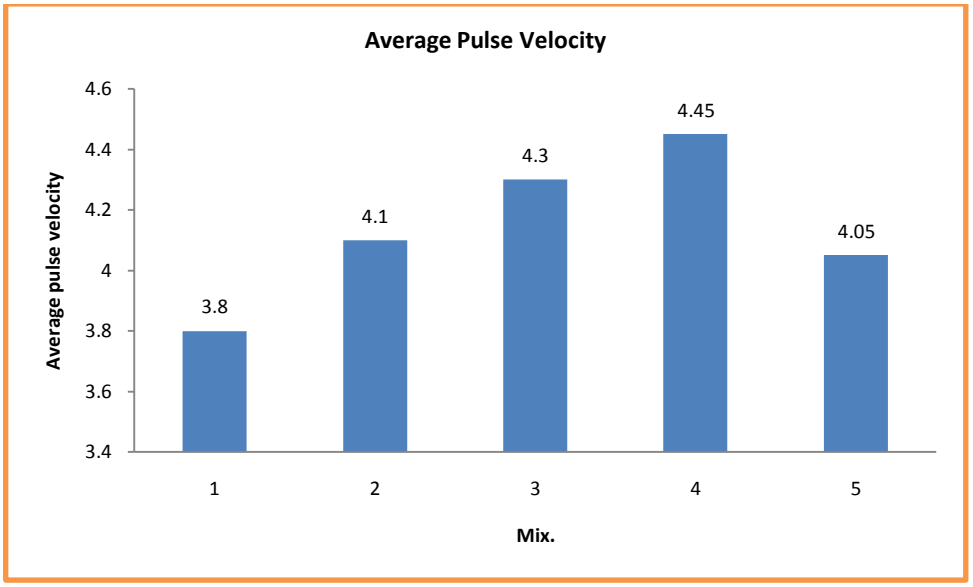
Table 4.2 shows that the splitting tensile strength test results of the samples follow an increasing trend till the 15% replacement thereafter there is decrease in the tensile strength. As the percentage replacement of the granite powder increases in the mix there is a rising trend in the graph observed in the tensile strength of the mix upto replacement level of 15% and as the percentage replacement increases to 20% there is decrease in the tensile strength observed probably due to an increase in granite powder replacement percentage with fiber.

4.4 UPV Test Results

The results of the UPV tests conducted on concrete specimens of different mixes cured at different ages are presented and discussed in this section. The UPV test was conducted at curing ages of 28 days. The UPV test results of all the mixes at different curing ages are shown in Table 4.4.

Table 4.4 UPV values at 28 days of curing

Description	Average pulse Velocity	Quality
100%OPC	3.8	Good
95%OPC+5%WP	4.1	Good
90%OPC+10%WP	4.3	Good
85%OPC+15%WP	4.45	Good
80%OPC+20%WP	4.05	Good



5. CONCLUSIONS

5.1 Introduction

In the current investigation, granite powder was used to examine the strength and UPV test. The experimental data obtained has been analysed and discussed in Chapter-4, to fulfil to the best of ability, the objectives set forth for the present investigation. This chapter gives the broad conclusions that may be drawn from the investigation.

a. It was find that workability of concrete decrease with increase of granite in concrete and also Reduction in bleeding is observed by addition of granite in the granite concrete mixes.
b. It is observed that compressive strength and tensile strength of concrete increase At dosage of about 15% granite powder compared with control mix of concrete at 28 days.
c. UPV value found to be higher for concrete containing 15% granite powder by weight of cement.
d. The highest value of dynamic modulus of elasticity was observed to be in mix 4 i.e. mix containing granite powder as 15% replacement on an average.

REFERENCES

1. Grzegorz Prokopskia, Vitaliy Marchukb, Andriy Hutsa,(2020). The effect of using granite dust as a component of concrete mixture. Case Studies in Construction Materials 13 (2020) e00349

2. A. Arivumangai T. Felixkala(2014). Strength and Durability Properties of Granite Powder Concrete. Journal of Civil Engineering Research 2014, 4(2A): 1-6 DOI: 10.5923/c.jce.201401.01

3. Molakani Pavan Kumar Smt. K. Chandrakala (2019). Characteristic Studies on Concrete by Partial Replacement of Fine Aggregate with Waste Granite Powder.International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Vol. 8 Issue 10, October-2019

4. Dr.T. Felix Kala (2013). Effect of Granite Powder on Strength Properties of Concrete. Research Inventy: International Journal Of Engineering And Science Vol.2, Issue 12 (May 2013), Pp 36-50 Issn(e): 2278-4721, Issn(p):2319-6483, Www.Researchinventy.Com

5. Mr. G. Raja Mr. K. M. Ramalingam(2016). Experimental Study on Partial Replacement of Fine Aggregate by Granite Powder in Concrete. IJIRST –International Journal for Innovative Research in Science & Technology| Volume Issue 12 | May 2016

6. Koneti Vamsi1, Rajarapu Bhushaiah1, Gangavarapu Manohar1, Kakani Krupasagar1(2019). Partial Replacement of Cement in Concrete with Granite Powder and Fine Aggregate with Saw Dust. International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056Volume: 06 Issue: 03 | Mar 2019

7. Narmatha Mahudeswaran (2018). Partial replacement of sand by granite powder in concrete. International Journal of Precious Engineering Research and Applications (IJPERA) www.ijpera.com ISSN: 2456-2734,Volume 3, Issue 1 (Jan- May) 2018), PP. 16-20

8. Indian Standard IS: 516-1959, bureau of India standards, Manak Bhawan, 9 Bahadur Shah Zafar Marg, New Delhi 110002.

9. Indian Standard IS 383-1970, Bureau of India Standards, Manak Bhawan, 9 Bahadur Shah Zafar Marg, New Delhi 110002.

10. Indian Standard IS: 10262-2009, Bureau of India Standards, Manak Bhawan, Bahadur Shah Zafar Marg, New Delhi 110002.