International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 03 | Mar 2019 www.irjet.net p-ISSN: 2395-0072

EXPERIMENTAL STUDY ON CONCRETE ADDING WITH GRANITE DUST AND COPPER SCRAP

MATHANKUMAR S

Assistant Professor, Department of Civil Engineering, Sree sakthi Engineering College, Coimbatore, Tamilnadu, India

---

Abstract - *The main parameter investigated in this study is the concrete with replacement of sand by waste by-products like granite dust in 25% sand and copper scrap in 1%, 1.5%, 2%. Compressive strength test and Split tensile strength test for 7 and 14 days curing period were studied. The grade of concrete used in this experiment is M30. Variations in strength parameter of the different ratios were observed by the increase in granite dust and copper scrap percentage. Granite dust increases the compressive strength of the concrete. Copper scrap increases the tensile strength by reducing the micro cracks in concrete.*

Key Words: Granite dust, Copper scrap, Compressive strength, Split tensile strength, Micro cracks.

1. INTRODUCTION

Essential component of the concrete is fine aggregate. The commonly used fine aggregate is river sand. But now a days there is a scarcity in river sand (fine aggregate). So we have to manage the waste generated by effectively utilizing the benefits of wastes (granite dust and copper scrap) by the usage of these waste by-products makes the concrete economical by the partial replacement of the fine aggregate. The wastes of granite dust are generated in India per year were calculated to be around 17.8 million tons. Granite dust is easily available and it causes lung cancer with heavy exposures. Copper scrap is non-biodegradable and its disposal causes land pollution. It can be also effectively used as a filler material in the concrete, partially replacing the fine aggregate which will help in filling up the pores in the concrete. This experiment is aimed at finding out the strength in concrete while partially added the granite dust and copper scrap in certain percentage of mix proportions.

2. METHODOLOGY

1. Studying literature related to granite dust and copper scrap used in concrete.
2. Selection the materials based on their properties and quality (cement, fine aggregate, coarse aggregate, water, granite dust and copper scrap).
3. Calculating the ratio of mix proportions by design mix or nominal mixes for grade of concrete.
4. Select the method of mixing such as hand mixing or machine mixing.
5. Casting of concrete specimen such as cube and cylinder.
6. Curing of concrete by water or some other methods for 7 days and 14 days.
7. The specimens are carried out for testing for 7 days and 14 days in various testing.

3. MATERIALS AND THEIR PROPERTIES

3.1 MATERIAL USED

1. Cement
2. Coarse aggregate
3. Fine aggregate
4. Granite dust
5. Copper scrap
6. Water

3.2 CEMENT

Cement acts as a binding material in concrete. Ordinary Portland cement confirming to IS: 12269-1987 is used in this experiment. The cement is of 53 grade and the test conducted on cement are

Table- 1: Characteristics of Cement

Serial no.	Characteristics	Values
1.	Specific gravity	3.09
2.	Standard consistency	24%

3.3 COARSE AGGREGATE

Aggregates are composite material. The coarse aggregate used in the nominal size of 20 mm, crushed angular and

free from saw dust. The tests conducted on coarse aggregates are

Table- 2: Characteristics of coarse aggregate

Serial no.	Characteristics	Values
1.	Water absorption	2.725%
2.	Specific gravity	2.7
3.	Crushing strength	27.9%

3.4 FINE AGGREGATE

Fine aggregate is consist of natural sand or crushed stone. It is used for particles smaller than 4.75mm sieved. M-sand is used as a fine aggregate in this study. It helps to fill voids between coarse aggregate and acts as a workability agent.

Table-3: Characteristics of Fine aggregate

Serial no.	Characteristics	Values
1.	Specific gravity	2.67

3.5 GRANITE DUST

Granite dust is a general type of igneous rock. It is a waste material from the granite polishing industry. It has been used in this experimental work. It can be used as a filler material (partial replacement of sand) to reduce the void in concrete.

Table-4: Characteristics of Granite Dust

Serial no.	Characteristics	Values
1.	Specific gravity	2.52

3.6 COPPER SCRAP

It consist of copper wire and covered with plastic insulation. It control micro cracking due to both the plastic and drying shrinkage. The length of the copper scrap is 2 cm and area of 1mm^2. It is used as a fiber reinforcing material in concrete for the following reasons:

1. Corrosion resistant
2. Tough
3. Antibacterial
4. Ductile
5. Alloys easily

3.7 WATER

Portable water is used for both concrete mixing and curing. The most recommended water should be free from salts, organic matter, oils, saw dust and other impure materials. The pH value should be lies in between 6 to 8.

4. TESTING OF FRESH AND HARDENED CONCRETE

4.1 TESTING OF FRESH CONCRETE

1. Slump cone test
2. Compaction factor test

4.1.2 SLUMP CONE TEST

Slump cone test is used to determine the consistency or workability of the fresh concrete. It is the simple method to determine the concrete quality immediately along with low cost. Water cement ratio = 0.45.

Slump value = 300-180= 120mm

Fig-1: Slump cone test

4.1.3 COMPACTION FACTOR TEST

Compaction factor is to calculate the workability of the fresh concrete.Water cement ratio= 0.45

Compaction factor = 0.93

4.2 TESTING OF HARDENED CONCRETE

1. Compressive strength test
2. Split tensile test

5. RESULTS AND ANALYSIS

5.1 COMPRESSIVE STRENGTH

Compressive strength is one of the important properties of concrete. Size of concrete cubes 150mm x 150mm x 150mm. The compressive strength for the conventional concrete was observed as 32.76N/mm^2 which increases to 36.22N/mm^2 with 25% GD & 1.5% CS increases in replacement of fine aggregate.

Compressive strength = Load / Area (N/mm^2)

Fig-2: Compressive test

Table-5: Compressive Strength in concrete

Serial no.	Mix proportion	Compressive strength(N/mm^2)	
		7 Days	14 Days
1.	0% GD & 0% CS	22.75	32.76
2.	25% GD& 1% CS	23.88	34.33
3.	25% GD & 1.5% CS	25.78	36.22
4.	25% GD& 2% CS	24.9	35.55

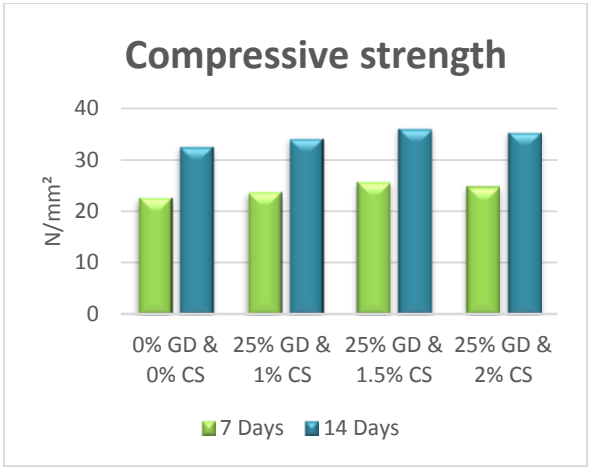

Chart-1: Compressive strength

5.2 TENSILE STRENGTH

To determine the tensile strength of the concrete. Concrete is weak in tension because of brittle nature. Therefore it does not resist the tension completely. So, the concrete develops cracks when the tensile force acts on it more than the tensile strength. Size of concrete cylinders 150mm diameter and 300mm length.

Tensile strength = 2P/πDL (N/mm^2)

P - Failure load

D - Diameter of the specimen

L – Length of the specimen

Table-6: Tensile strength in concrete

Serial no.	Mix proportion	Tensile strength(N/mm^2)	
		7 Days	14 Days
1.	0% GD & 0% CS	1.8	3.99
2.	25% GD& 1% CS	2.18	4.05
3.	25% GD & 1.5% CS	3.60	4.56
4.	25% GD & 2% CS	3.45	4.36

Fig-3: Tensile strength test

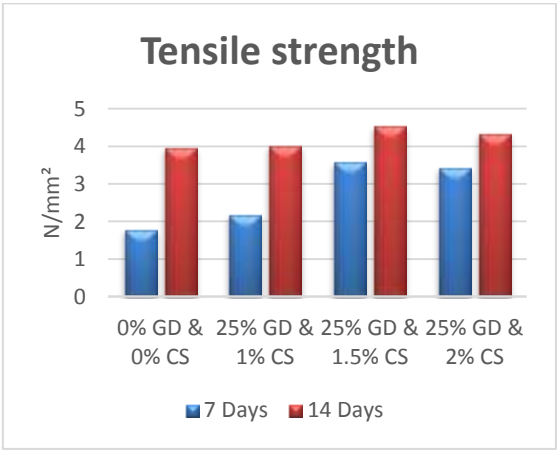

Chart-2: Tensile strength

6. CONCLUSION

The material test and strength were done in laboratory as per codal provisions. From the compressive test result, strength has increased for about 3Mpa greater than conventional concrete at 14 days. The tensile test result has also considerably increased as the partial replacement of granite dust and copper scrap with fine aggregate. Of all the 3 mixtures, granite dust 25% and

copper scrap 1.5% has achieved superior results than conventional concrete making it economical as well.

7. REFERENCES

[1] T. Felix Kala, ''Effect of Granite Powder on Strength Properties of Concrete", International Journal of Engineering and Science, Vol.2, Issue 12, pp 36-50, May 2013.

[2] Krishna Kumar S "Experimental Study of Concrete using Waste Marble Powder and Quarry dust partial replacement of Cement and Fine aggregate" in IJCSER, 2015.

[3] Chowdary, P. L (2015). Studies on strength properties on effect of waste granite powder on the compressive strength of concrete, Journal of Environmental science, Computer science and Engineering & Technology (JECET), Section A : Environmental Science, 4(3):716-727.

[4] Sai venu Madhav-"An Experimental Study on Mechanical properties of E-Plastic Waste Concrete".

[5] K.T Radha sumithra, ABS Dadapheer-"Experimental Investigation on the Properties of sisal fiber reinforced concrete.

8. BIOGRAPHY

Mr. Mathankumar S was born in 1992 in Ariyalur District, Tamilnadu. He completed his under graduate in Star lion College of Engineering and Technology and his post graduate in Star lion College of Engineering and Technology in India. He is an assistant professor in department of civil engineering from Sree Sakthi Engineering College, Coimbatore, India.