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STUDY OF COMPRESSIVE STRENGTH OF CONCRETE BY REPLACING NATURAL SAND TO THE CRUSHED SAND WITH QUARRY DUST

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Abstract: This experimental study shows how the strength of concrete changes when sand is replaced by crushed sand (CS) and quarry dust (QD) in 10% increments from 0% to 30%. M25 grades of concrete were studied with a constant slump of 60mm. The compressive strength of concrete cubes at the age of 7 and 28 days were obtained at room temperature. Also the temperature effect on concrete cubes at 100 degree C on 28th day of casting was carried out to check the loss of strength. From test results it was found that the maximum compressive strength is obtained only at 30% replacement at room temperature and net strength after loss due to hike in temperature was above the recommended strength value due to 30% replacement itself. This study clearly shows that quarry dust can be used in concrete mixtures as a good alternative for natural river sand, providing greater strength at 30% replacement. In an experimental research of the strength characteristics of concrete utilising crushed stone dust as fine aggregate, it was discovered that the compressive strength, flexural strength, and tensile strength of concrete increased. The current study demonstrates that the properties of mortars and concrete including crushed stone dust as fine aggregate are better to those of natural river sand as fine aggregate. The findings apply to the most often used grading zone - II sand. Crushed stone dust created from hard rock that falls within the grading Zone II sand, grading restrictions given by IS 383 code, is appropriate as fine aggregate in building mortars. Additionally, the IS-2116 and IS 383 regulations allow for the use of crushed stone fine aggregate in masonry mortars. This research discusses the effect of stone dust content in sand on mortar characteristics.

Index Terms - CS- Crushed Sand, QD- Quarry Dust.

I. INTRODUCTION

The current study focuses on the effect of varying sand-to-quarry-dust replacement proportions on the characteristics of concrete. The current study intends to investigate the impacts of quarry dust addition in normal concrete and to measure the pace of compressive strength growth. The study's emphasis on the concept of replacing natural fine aggregate with quarry dust could increase the consumption of quarry dust generated by quarries. Quarry dust replacement reduces the need for landfill space while also addressing the issue of natural sand scarcity.

The supply of low-cost sand as a fine aggregate in concrete is insufficient, prompting the search for an alternate material. Quarry dust, as a low-cost substitute for sand, fits this requirement. It even adds to the burden of dumping the crusher dust in one location, resulting in environmental contamination. According to the findings of the experimental research, quarry dust can be utilized as a replacement for fine aggregate. It

has been discovered that replacing 40% of fine aggregate with quarry dust yields the best results in terms of strength compared to standard concrete, and then decreases from there.

The compressive strength of concrete is calculated for various percentages and grades by replacing sand with quarry dust.

II. OBJECTIVES:

- To investigate the effect of mix quarry dust and crushed sand with the prescribed proportion on strength of concrete.
- To obtain favorable percentage of quarry dust in crushed sand which will give higher strength of concrete.
- To achieve strength results with maximum economy by using quarry dust as acombined material with crushed sand.

Mix Proportions after design :

Cement = 348.33 kg/m3

Water = 191.58 kg/m3

Fine Aggregate = 758.80 kg/m3 Coarse

Aggregate = 1160.93 kg/m3 Free

Water-Cement Ratio =0.55

Mix Proportions =1 : 2.17 : 3.33

Quarry Dust :

10 % of crushed sand has been replaced by quarry dust into concrete.

a) For 10% of quarry dust Crushed sand = 33.76 Kg
Dust quantity = 33.76 x 0.1 = 3.376 Kg Total crushed sand = 33.76 – 3.376 = 30.384 Kg

b) For 20% of quarry dust Crushed sand = 33.76 Kg
Dust quantity = 33.76 x 0.2 = 6.752 Kg
Total crushed sand = 33.76 – 6.752 = 27.00 Kg

c) For 30% of quarry dust Crushed sand = 33.76 Kg
Dust quantity = 33.76 x 0.3 = 10.128 Kg
Total crushed sand = 33.76 – 10.128 = 23.53 Kg

III. EXPERIENTAL RESULTS AND CONCLUSION

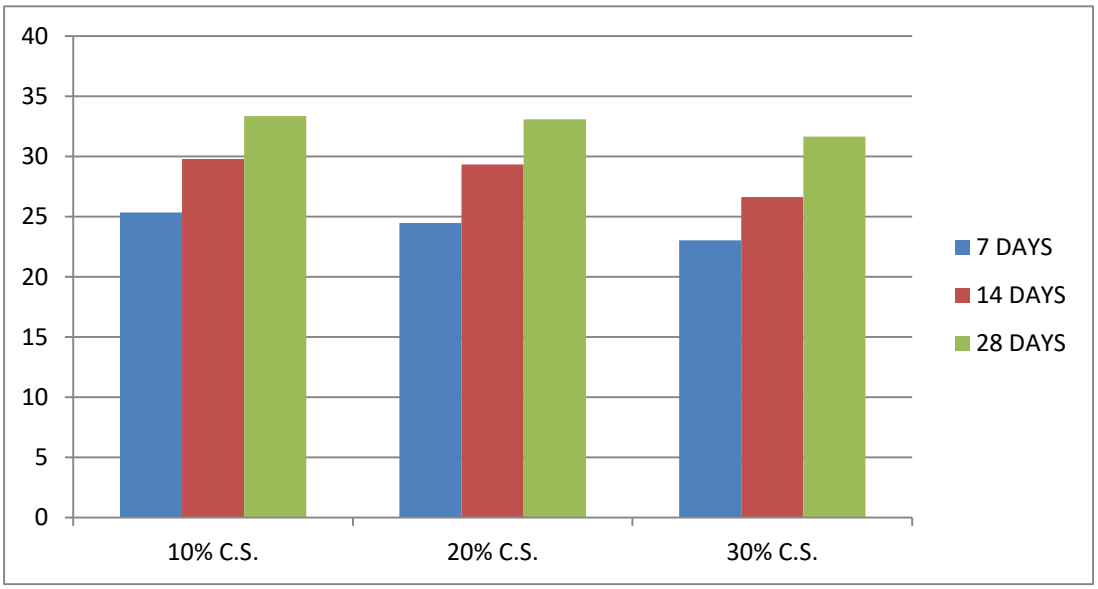
The results obtained from the study of crushed sand with quarry dust for 7days, 14days and 28days curing ages for
compressive strength of concrete are as follows:

Table no.1

% OF DSUT IN CRUSHED SAND	CHAR. STRENGTH OF CONCRETE		
	7 DAYS	14 DAYS	28 DAYS
10% OF CRUSHED SAND	25.33	29.77	33.35
20% OF CRUSHED SAND	24.45	29.33	33.09
30% OF CRUSHED SAND	23.02	26.61	31.65

Fig 3.1(a)

Fig 3.1(b)



CHARTERISTIC STRENGTH OF CONCRETE BY USING CRUSHED SAND AND QUARRY DUST.

IV. CONCLUSION:

• The idea of substituting quarry dust for natural fine aggregate, which is highlighted in this study, could increasethe use of generated quarry dust, lowering the need for landfill space and preserving the limited supply of natural sand for long-term sustainable growth. The bonding of the fine aggregates, which fill the spaces left by the coarse aggregates, is what gives concrete its strength.

• It has been discovered that concrete has greater strength for w/c of 0.45 than w/c of 0.5. When quarry dust is substituted for water, compressive strength falls as water content rises. This is because quarry dust has the ability to absorb water. It is widely known that a quarry dust replacement with a water-cement ratio of 0.45 enhances the w/c ratio. The results are reported.

• It can be inferred from the experimental study that quarry dust can be utilized in place of fine aggregate. It has been discovered that replacing 30% of the sand in standard concrete with quarry dust results in the strongest concrete, and that strength then starts to decline at 40%. Results showed that replacing up to 30% of the sand with quarry dust increased compressive strength, and that as replacement increased, workability of concrete decreased. Waste and its effects on the environment can be greatly diminished as a result.

V. REFERENCES :

1. A. Hmaid Mir, “Improved concrete properties using quarry dust as replacement for natural sand,” International Journal of Engineering Research and Development, vol.11,no.3,pp.46–52, 2015
2. B. Felekoglu, K. Tosun, B. Baradan, A. Altun, and B. Uyulgan, “The effect of fly ash and limestone fillers on the viscosity and compressive strength of self-compacting repair mortars,” Cement and Concrete Research, vol. 36, no. 9, pp. 1719–1726, 2006.
3. B. Sukumar, K. Nagamani, and R. Srinivasa Raghavan, “Evaluation of strength at early ages of self-compacting concrete with high volume fly ash,” Construction and Building Materials,vol. 22, no.7, pp.1394–1401, 2008.
4. D.W.S. Ho, A.M.M. Sheinn, C. C. Ng, and C. T. Tam, “The use of quarry dust for SCC applications,” Cement and Concrete Research,vol.32,no.4,pp.505–511,2002.
5. H.A.F.Dehwah, “Corrosion resistance of self-compacting concrete in cooperating quarry dust powder, silica fume and fly ash,” Construction and Building Materials, vol.37,pp.277– 282,2012.
6. I.B.Muhit, M.T.Raihan, and M. Nuruzzaman, “Determination of mortar strength using stone dust as a partially replaced material for cement and sand,” Advances in Concrete Construction, vol.2,no.4,pp.249–259,2014.
7. J. O. Ukpata and M. E. Ephraim, “Flexural and tensile strength properties of concrete using lateritic sand and quarry dust,” ARPN Journal of Engineering and Applied Sciences, vol. 7, pp. 324–331,2012.
8. M. N. Soutsos, K. Tang, and S. G. Millard, “Concrete building blocks made with recycled demolition aggregate,” Construction and Building Materials, vol.25,no.2,pp.726–735,2011.
9. M.R. Chitlangeand P.S.Pajgade, “Strength appraisal of artificial sand as fine aggregate in SFRC,” ARPN Journal of Engineering and Applied Sciences, vol.5, no.10, pp.34–38, 2010.
10. R. Ilangovana, N. Mahendrana, and K. Nagamanib, “Strength and durability properties of concrete containing quarry rock dust as fine aggregate, ”ARPN Journal of Engineering and Applied Sciences,vol.3,no.5,pp.20–26,2008