RESEARCH PAPER | Engineering | Volume : 6 | Issue : 5 | May 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

Performance of Limestone Powder on Strength Properties as Partial Replacement of Fine Aggregate in Concrete Mix

KEYWORDS: Natural river Sand, coarse aggregate, opc, Lime Stone Powder, compressive strength.

Tanveer Asif Zerdi	Md Imran	Safiulla mohammad
Director, Professor & H.O.D Civil Engineering Dept, K.C.T.E.C, C/o Dr Meenaz hospital, H No 5-408/40/1&2, Near KBN Medical College, Roza B, Madeena colony, Kalburgi. Karnataka, India.	U.G STUDENT Dept Of Civil Engineering V.T.U University, K.C.T.E.C Kalaburgi Karnataka.	U.G STUDENT Dept Of Civil Engineering V.T.U University, K.C.T.E.C Kalaburgi Karnataka.

Mohd Ahmed Pasha	Tazeem-ul-haq Zerdi
U.G STUDENT Dept Of Civil Engineering V.T.U University, K.C.T.E.C Kalaburgi Karnataka.	Student saint marry, Kalburgi, Karnataka, India

ABSTRACT *A study is conducted to determine the engineering properties viz. Compressive Strength, and water absorption capacity by partial replacement of river sand in concrete. In recent days the demand for river sand is increasing due to its lesser availability. Hence the practice of partially replacing river sand with lime stone powder is taking a tremendous growth. It is also inferred from the literature that partially replacement of normal river sand with lime stone powder produces the appreciable increase in compressive strength by different variation of percentages of limestone powder replaced. The lime stone powder obtained from limestone quarries. The concrete are made using varying contents of lime stone powder as fine aggregate in ordinary Portland cement. The concrete cubes of M20 grade are made. It was found that at 0.50 water/cement ratio higher compressive strengths are obtained of concrete, and better workability for M20 mix, proportion. These results compare favorably with those of conventional concrete. The concrete was found to be suitable for use as structural members for buildings and related structures.*

1. INTRODUCTION

Conventionally concrete is mixture of cement, sand and aggregate. Properties of aggregate affect the durability and performance of concrete, so fine aggregate is an essential component of concrete. The most commonly used fine aggregate is natural river or pit sand. Fine and coarse aggregate constitute about 75% of total volume. It is therefore, important To obtain right type and good quality aggregate at site, because the aggregssate form the main matrix of concrete or mortar [1, 2]. The global consumption of natural sand is very high, due to the extensive use of concrete. In general, the

Demand of natural sand is quite high in developing countries to satisfy the rapid infrastructural growth, in this situation developing country like India facing shortage in good quality natural sand [3, 4]. Particularly in India, natural sand deposits are being depleted and causing serious threat to environment as well as the society. Increasing extraction of natural sand from river beds causing many problems, loosing water retaining sand strata, deepening of the river courses and causing bank slides, loss of vegetation on the bank of rivers, exposing the intake well of water supply schemes, disturbs the aquatic life as well as affecting agriculture due to lowering the underground water table etc are few examples.

In past decade variable cost of natural sand used as fine aggregate in concrete increased the cost of construction. In this situation research began for inexpensive and easily available alternative material to natural sand. Some alternatives materials have already been used as a part of natural sand e.g. copper slag, Slag limestone and siliceous stone powder were used in concrete mixtures as a partial replacement of natural sand [5]. However, scarcity in required quality is the major limitation in some of the above materials. Now a day's sustainable infrastructural growth demands the alternative material that should satisfy technical requisites of fine aggregate as well as it should be available abundantly. So we have studied the strength and behavior of concrete by using limestone powder as fine aggregate, they investigated the possibility of using limestone powder as 30 % replacement for sand, with varying compacting factors. On this basis, limestone powder offers viable. Alternative. So by using the limestone powder as the replacement of fine aggregate by consecutive %. We have studied that the increase in % of limestone powder as the replacement, it increases the compressive strength also.

RESEARCH SIGNIFICANCE

The main objective of the present work was to systematically study the effect of water cement ratio and percentage replacement of limestone powder by natural sand as 0%, 10%, 20% and 30% respectively on the strength properties of concrete. The study was carried out on M20 grade concrete with 0.5 water cement ratio. Limestone powder can be used as fine Aggregate, but it has to satisfy the technical requisites like workability and strength. On this aspect research on concrete with limestone powder is scarce, so this paper investigates the concrete produced with limestone powder.

2. EXPERIMENTAL INVESTIGATION:

M ATERIALS

2.1 CEMENT

Ordinary Portland cement 53 grade conforming to IS 8112

Volume : 6 | Issue : 5 | May 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

– 1989, and specific gravity of cement is found to be 3.18.

2.2 LIMESTONE POWDER

Lime stone powder conforming to IS 8112 – 1989, and specific gravity of cement is found to be 2.95.

TABLE FOR CHEMICAL PROPERTIES OF CEMENT AND LIMESTONE POWDER.

COMPONENT	CEMENT	LIMESTONE POWDER
Sio_2	21.8	1.81
Al_2o_3	4.8	0.23
Fe_20_3	3.8	0.26
Cao	63.3	52.38
So_3	2.04	1.68
Mgo	0.91	0.26
Na_2o	0.21	-

2.3 FINE AGGREGATE

Locally available river sand having bulk density 1782 kg / m3 is used and the specific gravity 2.68 and fineness modulus of river sand is 3.11

2.4 COARS AGGREGATE

Considering all the above aspects, blue granite crushed stone aggregate of 12.5mm as maximum size and of typical particle shape "average and cubic" are used as the course aggregate for the present investigation. The aggregates are tested as per the procedure given in BIS: 2386- The bulk density of coarse aggregate 1630 kg/m2 and the specific gravity 2.79 and fineness modulus of coarse aggregate 6.93.

2.5 WATER

Potable tap water was used for the preparation of specimens and for the curing of specimens.

3. MIX PROPERTIONS

In the present investigation the percentage of limestone powder is fixed as 30% by carrying out trials on workability test and for this percentage of limestone powder, the limestone powder is varied as 0%, 10%, 20%, and 30% and changes in the behaviour of concrete in fresh state and hardened state is being studied. The limestone powder replaces the sand partially. Mix design is adopted for designing M20 grade of mix.The mix proportion and the mix designation for various percentage of replacement of limestone powder by sand

4. EXPERIMENTAL PROCEDURE

The mix ratio is prepared for 1:1.76:2.97 for lime stone powder. The fine aggregate and ordinary Portland cement portion of the mix is achieved by combining lime stone powder in ratio with 0%,10%,20%and30%. The materials are then mixed thoroughly before adding the prescribed quantity of water and then mixed further to produced fresh concrete. Water cements ratios of 0.50 were adopted. The specimen is prepared for compressive strength for cube size (150 x 150 x 150) mm is prepared for water absorption test. The specimen is tested 28 days totally for 12 cubes. All the specimens are remolded after 24 hours, and curing is done in water for 3 dyas, 7 days, 14 days and 28 days. The specimens are tested for 3 dyas, 7 days, 14 days and 28 days with each proportion of lime stone powder.

5. RESULTS AND DISCUSSIONS

Compressive strength of concrete.

The test is carried out conforming to IS 516 -1959 to obtain compressive strength of concrete at the 3 days, 7days, 14 days and 28 days. The cubes are tested using compressive testing machine (CTM).The results are presented below. The 3days compressive strength of conventional concrete 0%, 10%, 20% and 30%.

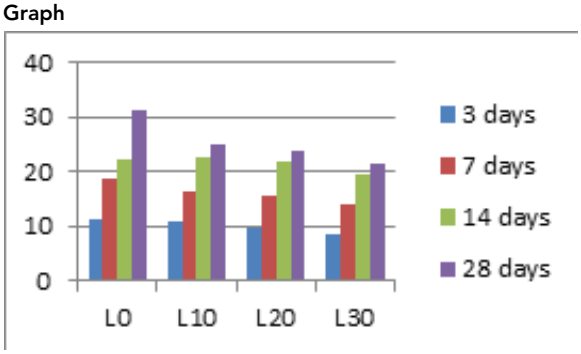
Concrete is 11.44, 11.05, 9.68 and 8.69 n/mm2, 7 days strength of conventional concrete are 18.60, 16.40, 15.73 and 14.13 n/mm2, 14 days conventional concrete strength are 22.45, 22.70, 21.78 and 19.56 n/mm2 of compressive strength is reduced when compared to the 20% and 30% concrete which is found that 1:1.76.2.97 mix ratio. The compressive strength of conventional concrete 10%, 20% and 30% is more or less same having M20 grade of concrete.

The 28 days compressive strength of conventional concrete 0%, 10%, 20% and 30% concrete 31.27, 24.97, 23.96 and 21.52 n/mm^2 of compressive strength is reduced when compared to different proportions of concrete which is found that 1:1.76:2.97 mix ratio. The compressive strength of 20% shows the increase in strength than 30%.

Compressive strength of concrete.

Sample Series				
	3days	7days	14days	28days
L0	11.44	18.60	22.45	31.27
L10	11.05	16.40	22.70	24.97
L20	9.68	15.73	21.78	23.96
L30	8.69	14.13	19.56	21.52

Graph



6. CONCLUSIONS

It can be seen from the results of this study that the different proportions 0f lime stone powder replaces the conventional river sand in the production of concrete for construction industry. The compressive strength of concrete and water absorption test using lime stone powder are measured in the laboratory. Compressive strength is found to increase with age as for normal concrete. The 28 – day compressive 0%, 10%, 20% and 30% concrete 31.27, 24.97, 23.96 and 21.52 N/mm2 for different mixes. The above strength properties the proportion of limestone

Volume : 6 | Issue : 5 | May 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

powder produced higher values of compressive strength. For the same proportion 0%,10%, 20% and 30% at 1:1.76:2.97 mixes and 0.50 water cement ratio. The water absorption is Conventional concrete specimen resulted to decrease of the water absorption and permeability of the concrete when compare 0%,10%, 20% and 30% to Further work is required to get data for other structural properties of the experimental concrete.

REFERANCES

1). A Jayaraman. "Experimental Study on Partial Replacement of Natural Sand with M- Sand and Cement with Lime Stone Powder".in International Journal of ChemTech Research, CODEN (USA): IJCRGG, ISSN: 0974-4290, Vol.6, No.2, pp 948-954, April-June 2014.

2) B. Beeralingegowda, V. D. Gundakalle "The effect of addition of lime-stone powder on the properties of self-compacting concrete" in International Journal of Innovative Research in Science, Engineering and Technology.(An ISO 3297: 2007 Certified Organization), Vol. 2, Issue 9, September 2013, Copyright to IJIRSET www.ijirset.com 4996. ISSN: 2319-8753. Pp: 4996-5014.

3) C.Dhanalaxmi,Dr K.Nirmalkumar " Study on durability properties of limestone powder concrete incorporated with steel fibres".In International Journal of Advanced Technology in Engineering and Science www.ijates.com, Volume No.03, Issue No. 05, May 2015 ISSN (online): 2348-7550.Pp:92-101.

4) C.Selvamony, M.S Ravikumar, S.U. Kannan and S.Basil Gnanappa "Investigations on self-compacted self-curing concrete using limestone powder and clinkers". VOL. 5, NO. 3, March 2010 ISSN 1819-6608, ARPN Journal of Engineering and Applied Sciences, ©2006-2010 Asian Research Publishing Network (ARPN). All rights reserved. www.arpnjournals.com. PP: 1-6.

5) Stefania Grzeszczyk ,Piotr Podkowa,(2009) "The Effect of Limestone Filler on the Properties of Self Compacting Concrete". Annual transactions of the Nordic rheology society, vol. 17, 2009

6) S.K. Jai1, P.G. Patil, N.J. Thakor,(2011) "Engineering properties of laterite stone scrap blocks". Agricultural Engineering International: CIGR Journal. Vol.13, No.3, 2011. Manuscrip No.1738.

7) Kasthurba. A. K, (2012) "Characteristics of Malabar Laterite as a Building Material Field and Laboratory Studies". International journal of earth science. ISSN 0974-5904, Volume 05, No. 03 (01).