ISSN: 2321-2152

IJMECE

International Journal of modern electronics and communication engineering

E-Mail
editor.ijmece@gmail.com
editor@ijmece.com

www.ijmece.com

ISSN2321-2152www.ijmece .com
Vol 8, Issue.1Jan 2020

COMPRESSION OF HCL ACID BETHAMCHERLA MARBLE STONE AGGREGATE BEHAVIOR

K.HEMANTH KUMAR REDDY[1], MV RAVIKIŞHOREREDDY[2], V.RAMESH BABU[3]
D. JAGANMOHAN[4]

ABSTRACT
Concrete plays the most prominent role in the structural construction works, it is the most widely used as a materials used in building all across the globe. Concrete is second only to water in terms of worldwide consumption. It's crucial to the development of our society and the future of the building sector. Due to its long lifespan, dependability, and adaptability, it has quickly become a staple in the building industry. The word "concrete" comes from the Latin word "concretes," which means "grows together," alluding to the chemical hydration process that transforms the material within from a viscoelastic condition into a hard, thick, and long-lasting product. Cement is the most widely used man-made product on the earth, and there are many different types of solid that each have their own unique features. However, we are not permitted to use all of our natural resources at this time. We have some scraps that weren't necessary for that sequence of tasks.
Bethamcherla marble stone aggregates are one such material used to substitute coarse aggregate in concrete.In this work, we describe the results of our research on the effects of various factors on the flexural strength of concrete. Bethamcherla marble stone aggregate (BMSA) cubes are compared to those created from more traditional aggregates. The BMSA is substituted for either some or all of the NGCA in the casting process, resulting in cubes of different proportions. The cubes are put through their paces by being filled with GI steel fiber at percentages of 0%, 1%, and 2% of the volume of a standard cube. Compressive strength of concrete consistently drops when using Bethamcherla marble stone aggregates to replace natural granite coarse aggregate (NGCA) at percentages of 0, 25, 50, 75, and 100%. When compared to a standard cube, the addition of 1% and 2% GI steel fibers resulted in significantly greater strength (volume).

Key-Words: Natural Granite coarseAggregate(NGCA), Bethamcherla marble stone aggregate(BMSA),GI steel fibers, Compressivestrength, concrete.

I. INTRODUCTION

Concrete's prominence in today's society is only expected to grow. It is estimated that ready-mixed concrete alone generates roughly $30 billion annually in revenue for the United States. The need for concrete is predicted to increase in the next years, surpassing current demand. In recent years, the rapid depletion of natural resources has been attributed to rising demand for building materials and consumer spending. However, a high output of concrete has resulted in a need for a great deal of coarse material, necessitating the use of natural resources that have a severe effect on the environment. A lack of ductility and strength may be compensated for by reinforcing concrete members with continuous reinforcing bars.

Additionally, steel reinforcement is used to counteract the high tensile and shear loads that may be present in key areas of concrete members. Steel reinforcement may increase concrete's strength, but using Galvanized Iron (G.I.) steel fibers in the mix can provide for more uniform tensile characteristics and fewer tiny fractures in the finished product. G.I. steel fibers' primary role is to stop micro-cracks from opening, boost the composite's load-bearing capacity, and permit greater stresses close to the fibers themselves. Some of the physical and mechanical features of coarse aggregate that contribute to the strength and workability qualities of concrete include: aggregate strength, moisture content, absorption, gradation, form and texture, and specific gravity. Therefore, before to using the coarse aggregate, its qualities must be assessed.

[1]Assistant professor , Dept of Civil Engineering, K.S.R.M College of Engineering, Kadapa, AP
[2,3]Associate professor, Dept of Civil Engineering, K.S.R.M College of Engineering, KADAPA, AP
[4]*Lecture, Dept. of Civil Engineering, JNTUA university, Ananthapuram, Andhra Pradesh, India* [3]

Bethamcherla marble is abundantly available, occupying about 10% of the earth's surface in different forms. The main constituent of Bethamcherla is calcium carbonate along with silica and iron as impurities .Many grades of limestone are available and their classification is done on the basis of calcium carbonate content. The marble rock is metamorphic from the lime stone. In this research work the performance of discarded flooring Bethamcherla limestone from the town of Bethamcherla, located in the Kurnool district of Andhra Pradesh is considere

This occurs in the naturally cleft slab like elements which on polishing and processing into regular shapes that would make an excellent strength of flooring stone that has the luster and finish on par with its granite counterpart. Bethamcherla waste stone is one of the natural mineral having specific gravity ranging from 2.6 to 2.85. Bethamcherla marble stones are fundamental flaggy lime stone with natural split. It is very excellent flooring stone, which have been unique geo mechanical properties required for flooring stones.

AIM AND SCOPE OF THE STUDY

Main aim of the study is to know the involvement of Bethamcherla waste stone in construction works. In this study importantly, it is concentrated on some basic properties Bethamcherla waste stone, to know the suitability of the Bethamcherla waste stone in construction works by conducting some workability tests and some mechanical properties tests, in this paper we worked with HCl acid attack compressive strength. To make explore the usage of local accessible materials to the surrounding people.

II. LITERATURE REVIEW

Bouzoubaa et al (2001) referred that researcher at the University of Tokyo, Japan, started in late 1980's to develop SCC to be mainly used for highly congested reinforced structures in seismic regions. The reason behind developing this concrete is the concerns regarding the homogeneity and compaction of cast-in-place concrete within intricate highly reinforced structures, improvement of overall durability and quality of concrete etc., due to lack of skilled labor in Japan. In the early 1990's there was only a limited public knowledge about SCC, mainly in the Japanese language. Concurrently with the Japanese developments in the SCC area, research and development continued in mix-design and placing of underwater concrete where new admixtures are producing SCC mixes with performance identical that of the Japanese SCC concrete (e.g. University of Paisley / Scotland, University of Sherbrooke / Canada) as stated by Ferraris

A major limitation of SCC is that there is a lack of globally agreed upon test standards and mix designs. The contractors used their large in-house research and development facilities to develop their own SCC technologies. Each company developed their own mix designs and skilled their own staff to act as technicians for testing on sites their SCC mixes. Special applications such as underwater concreting have always required concrete, which could be placed without the need for compaction. A very important aspect is that each of the large contractors also developed their own testing devices and test methods as presented by Bartos (2000).

III. MATERIALS AND PROPERTIES

Cement: Cement is the most important material in the concrete and it act as the binding material. Ordinary Portland cement of 53 grade was used.

Aggregate: The basic objective in proportioning any concrete is to incorporate the maximum amount of aggregate and minimum amount of water into the mix, and thereby reducing the cementitous material quantity, and to reduce the consequent volume change of the concrete.

Coarse aggregate:
The fractions from 20 mm are used as coarse aggregate. The Coarse Aggregates from Crushed Basalt rock, conforming to IS: 383 is being used.

Bethamcherla Marble Aggregate:
The stone itself, specifically in the forms of overburden, screening residual, stone fragments. Stone wastes are generated as a waste during the process of cutting and polishing. It is estimated that 175 million tons of quarrying waste are produced each year, and although a portion of this waste may be utilized on-site, such as for excavation pit refill or berm construction, the disposals of these waste materials acquire large land areas and remain scattered all around, spoiling the aesthetic of the entire region. In this project we crushed BMSA into required sizes i.e., 20mm .

Fine aggregate:

The amount of fine aggregate usage is very important in concrete. This will help in filling the voids present between coarse aggregate and they mix with cementitous materials and form a paste to coat aggregate particles and that affect the compact ability of the mix. The aggregates used in this research are without impurities like clay, shale and organic matters. It is passing through 4.75mm sieve.

Curing tank with 5% HCL Acid IV EXPERIMENTAL INVESTIGATION

Acid Attack Test on Compressive Test

The concrete cube specimens of various concrete mixes of size 150x150x150 mm were cast and cured in water containing with 5% HCl for 7 and 28 days. A pH value of 2 was maintained throughout the period of 7 and 28 days. After 7 and 28 days the specimens were taken out from the curing tank and allowed to dry for one day. The weights of concrete cube specimen were taken. Then, the specimens were tested for compressive strength. By the % loss of weight of specimen and the % loss of compressive strength on immersing concrete cubes in acid water, the resistance of concrete to acid attack wasfound.

Taking out the cubes from curing tankcontaining 5% HCL acid

Test results and discussion for 7 days

The results of compression strength made with NGCA and BMSA for seven days with 0,1,2%of G.I Steel fibres are presented in the table 5.4. From these it is observed that as a replacement of BMSA increases, the compressive strength decreases continuously.

For NGCA-0-0 the average compressive strength reported as 17.91 MPa and for BMSA-25-0, BMSA-50-0, BMSA-75-0 and BMSA-100-0,

The average compressive strength are 16.53,13.63,12.52 and9.51MPa respectively. Percentage decrease of average compressive strength with respect to NGCA-0-0 are 7.70, 23.90,

30.09 and 46.90 for BMSA-25-0, BMSA-50-0, BMSA-75-0 and BMSA-100-0 respectively.

For NGCA-0-1 the average compressive strength reported as 18.81MPa and for BMSA-25-1, BMSA-50-1, BMSA-75-1 and BMSA-100-1,

The average compressive strength are 17.83, 14.79, 12.85 and 11.37MPa respectively. Percentage decrease of average compressive strength with respect to NGCA-0-1 are 5.21, 21.37, 31.68 and

39.55 for BMSA-25-1, BMSA-50-1, BMSA-75-1 and BMSA-100-1 respectively.

For NGCA-0-2 the average compressive strength reported as 20MPa and for BMSA-25-2, BMSA-50-2, BMSA-75-2 and BMSA-100-2, The

average compressive strength are 18.62, 16.57, 13.81 and 12.62MPa respectively. Percentage decrease of average compressive strength with respect to NGCA-0-2 are 6.9, 22.15, 30.95 and

36.90 for BMSA-25-2, BMSA-50-2, BMSA-75-2

and BMSA-100-2 respectively.

Effect of G.I steel fibres for 7 days

The percentage increase in compressive strength for NGCA-0-1 and NGCA-0-2 is 5.02 and
11.67 over NGCA-0-0 mix. Similarly percentage increase for BMSA-25-1 and BMSA-25-2 mix is
7.86 and 12.64. The same trend continued for all other mixes. There is a percentage increase in compressive strength for BMSA-50-1 and BMSA- 50-2 mix is 8.51 and 14.23. Percentage increase in compressive strength for BMSA-75-1 and BMSA- 75-2 mix is 2.63 and 10.30. Percentage increase in compressive strength for BMSA-100-1 and BMSA-100-2 mix is 19.56 and 32.70.

Test results and discussion for 28 days

The results of compression strength made with NGCA and BMSA for twenty eight days with 0,1,2% of G.I Steel fibres are presented in the table
5.4. From these it is observed that as a replacement of BMSA increases, the compressive strength decreases continuously.

For NGCA-0-0 the average compressive strength reported as 26.87 MPa and for BMSA-25- 0, BMSA-50-0, BMSA-75-0 and BMSA-100-0,
The average compressive strength are 24.79, 20.45, 18.78 and 14.26MPa respectively. Percentage decreases of average compressive strength with respect to NGCA-0-0 are 7.74, 23.89, 30.11 and
46.75 for BMSA-25-0, BMSA-50-0, BMSA-75-0 and BMSA-100-0 respectively.

For NGCA-0-1 the average compressive strength reported as 28.21 MPa and for BMSA-25- 1, BMSA-50-1, BMSA-75-1 and BMSA-100-1,
The average compressive strength are 26.75, 22.18, 19.27 and 17.06 MPa respectively. Percentage decrease of average compressive strength with respect to NGCA-0-1 are 5.17, 21.37, 31.69 and
39.52 for BMSA-25-1, BMSA-50-1, BMSA-75-1 and BMSA-100-1 respectively.

For NGCA-0-2 the average compressive strength reported as 30.02 MPa and for BMSA-25- 2, BMSA-50-2, BMSA-75-2 and BMSA-100-2,
The average compressive strength are 27.93, 23.35, 20.72 and 18.93MPa respectively. Percentage decreases of average compressive strength with respect to NGCA-0-2 are 6.96, 22.22, 30.98 and
36.94 for BMSA-25-2, BMSA-50-2, BMSA-75-2 and BMSA-100-2 respectively.

Effect of G.I steel fibres for 28 days

The percentage increase in compressive strength for NGCA-0-1 and NGCA-0-2 is 4.99 and
11.72 over NGCA-0-0 mix. Similarly percentage increase for BMSA-25-1 and BMSA-25-2 mix is
7.91 and 12.67. The same trend continued for all other mixes. There is a percentage increase in compressive strength for BMSA-50-1 and BMSA- 50-2 mix is 8.46 and 14.18. Percentage increase in compressive strength for BMSA-75-1 and BMSA- 75-2 mix is 2.61 and 10.33. Percentage increase in compressive strength for BMSA-100-1 and BMSA-100-2 mix is 19.63 and 32.75.

CASTING OF SPECIMENS

Before placing the concrete inside faces of the mould are coated with the machine oil for easy removal afterwards after completion of the workability tests, the concrete has been placed in the standard metallic moulds in three layers and has been compacted each time by tamping rod. Before placing the concrete inside faces of the mould are coated with the machine oil for easy removal afterwards. The concrete in the moulds has been finished smoothly.

CURING

After casting the specimen, the moulds were air dried for one day and then the specimens were removed from the moulds after 24 hours of casting of concrete specimens. Markings have been done to identify the different percentages. All the specimens were cured in curing tank (water curing).

V. TEST RESULTS

Table: Average HCL Acid Compressivestrength 7 and 28 days testing

S.No	Nomenclature of the specimen	7 days Average HCL acid compressive strength in MPa	28 days Average HCL acid compressive strength in MPa	% difference on the 7 days HCL acid compressive strength	% difference on the 28 days HCL acid compressive strength
1	NGCA-0-0	17.91	26.87	-	-
2	BMSA-25-0	16.53	24.79	-7.70	-7.74
3	BMSA-50-0	13.63	20.45	-23.90	-23.89
4	BMSA-75-0	12.52	18.78	-30.09	-30.11
5	BMSA-100-0	9.51	14.26	-46.90	-46.93
6	NGCA-0-1	18.81	28.21	5.02	+4.99
7	BMSA-25-1	17.83	26.75	-0.45	-0.45
8	BMSA-50-1	14.79	22.18	-17.42	-17.45
9	BMSA-75-1	12.85	19.27	-27.69	-28.28
10	BMSA-100-1	11.37	17.06	-36.51	-36.51
11	NGCA-0-2	20.0	30.02	11.72	+11.72
12	BMSA-25-2	18.62	27.93	3.96	+3.94
13	BMSA-50-2	15.57	23.35	-13.06	-13.10
14	BMSA-75-2	13.81	20.72	-22.89	-22.89
15	BMSA-100-2	12.62	18.93	-29.54	-29.55

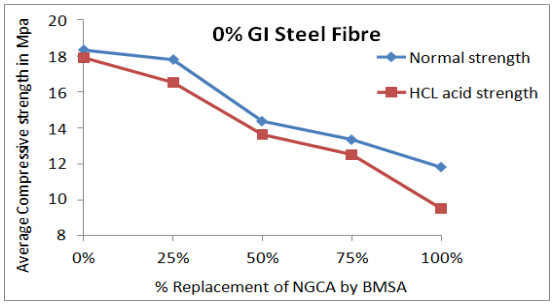

Figure: 7days average HCL Acid CompressiveStrength Vs % Replacement of NGCA by BMSA at 0% GI Steel Fibres

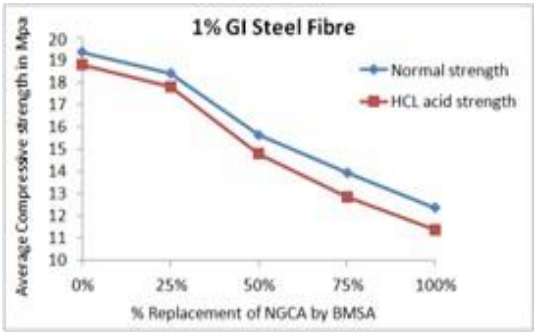

Figure: 7days average HCL Acid CompressiveStrength Vs % Replacement of NGCA by BMSA at 1% GI Steel Fibres

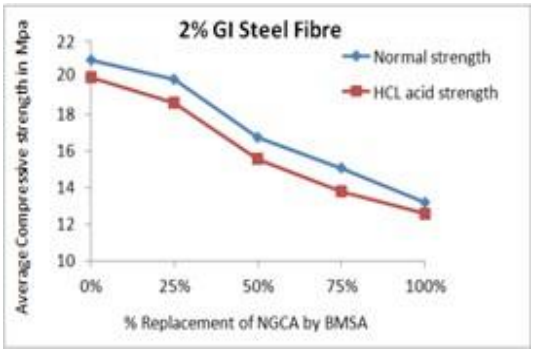

Figure: 7days average HCL Acid CompressiveStrength Vs % Replacement of NGCA by BMSA at 2% GI Steel Fibres

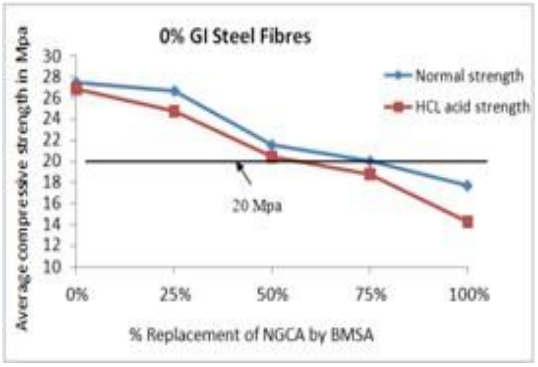

Figure: 28days average HCL Acid Strength Vs % replacement of NGCA by BMSA at 0% GISteel Fibres

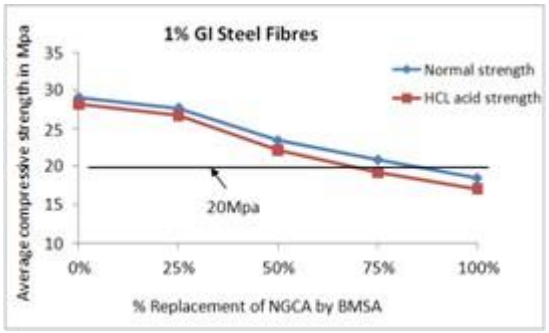

Figure: 28days average HCL Acid Strength Vs % replacement of NGCA by BMSA at 1% GISteel Fibres

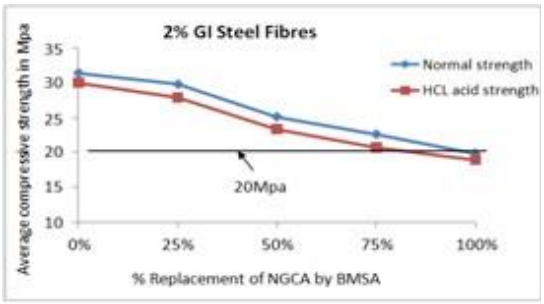

Figure: 28 average HCL Acid CompressiveStrength Vs % Replacement of NGCA by BMSA at 2% GI Steel Fibres

VI. CONCLUSIONS

For all percentage of replacement of NGCA with BMSA and all percentage additions of G.I steel fibre, the cube compressive strength is subjected to 5% HCl acid in water, with the increase in G.I steel fibre content, the strengths goes on increasing .

- For NGCA-0-0 the average compressive strength reported as 17.91MPa, 26.87MPa for 7days and 28 days respectively
- For NGCA-0-1 the average compressive strength reported as 18.81MPa, 28.21MPa for 7days and 28 days respectively
- For NGCA-0-2 the average compressive strength reported as 20.00MPa, 30.02MPa for 7days and 28 days respectively

REFERENCES

1. ANTONIO ANDRE, JORGE DE BRIO, ALEXANDRA ROSA, DIOGO PEDRO, Durability performance of concrete incorporating coarse aggregate from marble industry waste, Journal of cleaner Production 65,289-396, 2014.

2. ANKIT NILESHCHANDRA PATEL, PROF. JAYESHKUMAR PITRODA, STONE WASTE AS A GROUNDBREAKING CONCEPTION FORTHE LOW COST CONCRETE, International Journal of Engineering Trends and Technology (IJETT) - Volume4Issue4-April 2013.

3. ANKIT NILESHCHANDRA PATEL, JAYESHKUMAR PITRODA, Stone Waste: Effective Replacement of Cement for Establishing Green Concrete, International Journal of InnovativeTechnology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-2, Issue-5, April 2013

4. BABOO RAI,KAHN NAUSHAD H, ABHISHEK KR, TABIN RUSHAD S,

DU

GGAL S K, Influence if Marble Powder / Granules in concrete mix, International Journal of Civil and structural Engineering, Vol.1,No.4(2011)

5. BAHAR DEMIREL (2010), The effects of usingWaste Marble Dust as a fine material on the Mechanical properties of the concrete, International Journal of physical Sciences Vol. 5(9), pp1372- 1380, 18 August, 2010.