International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 3.45 (SJIF-2015), e-ISSN: 2455-2585
Volume 4, Issue 5, May-2018

IMPACT BEHAVIOUR ON BETHAMCHERLA MARBLE STONE AGGREGATE

V.RAMESH BABU[1], Dr. B.RAMESH BABU[2], Dr. C.SASHIDHAR[3]
[1]Assistant professor, Dept of Civil Engineering, K.S.R.M College of Engineering, KADAPA, AP
[2]Principal, P.V.K.K. Institute of Technology, Ananthapuram, Andhra Pradesh, India
[3]Professor, Dept. of Civil Engineering, JNTUA, Ananthapuram, Andhra Pradesh, India[3]

ABSTRACT

In the recent year demand for concrete has increased worldwide. This has lead to development of various studies on materials. Meanwhile we ae not allowed to complete the natural resource usage in concrete. We have some waste materials which were not useful in that pattern of works. One of those material is Bethamcherla marble stone aggregates as replacement of coarse aggregate in concrete. This paper represents the study of 'Impact test' of concrete for different combinations. The comparison is made between conventional aggregate beams and beams made with Bethamcherla marble stone aggregates (BMSA). The beams of varying proportions are casted replacing partially and totally natural granite coarse aggregate (NGCA) with using BMSA. The beams are tested by adding GI steel fibre of volume 0%, 1% and 2% of volume of conventional beam. It is observed that there is consistent decrease of impact strength of concrete of 0, 25, 50, 75 and 100 % of replacement of natural granite coarse aggregate (NGCA) with Bethamcherla marble stone aggregates. It was also observed that strength increased with respect to each other percentages when 1% and 2% of GI steel fibers were used compared with conventional beam

Key Words: ***Natural Granite coarse Aggregate, Bethamcherla marble stone aggregate, GI steel fibers, Impact test, concrete.***

I. INTRODUCTION

The global use of concrete is next to water in this era. As the demand for concrete as construction material increases, the demand and scarcity has been raised to a peak.

There has been rapid increase in the waste materials and by products production due to exponential growth rate of population from last few decades the basic strategies to decrease solid waste disposal problems have been focused at the reduction of waste production and recovery of usable materials from the waste as raw materials as well as utilization of waste as raw materials whenever possible. Natural aggregate is becoming expensive due to scarcity. The world-wide consumption of natural aggregate as coarse aggregate in concrete production is very high and several developing countries have encouraged some demand in the supply of natural aggregate in order to meet the increasing needs of infrastructural development in recent years. In particular, the demand of natural aggregate is quite high in developing countries owing to rapid infrastructural growth.

In the recent years, the growth in industrial production and the consequent increase in consumption have lead to fast decline in available natural resources on the other hand, a high volume of production has generated a considerable amount of course material which have adverse impact on the environment. The Civil Engineering construction industry is to be one of the most potential consumers of mineral recourses, thus generating a great amount of solid waste as a bye product stones. Stones have perhaps the noblest material from nature used by men for his artistic expression. There are many natural stone wonders the earth offers us which we must pamper as unique treasures. India offers a variety of a natural stone viz; Granite, Sandstone, Slates, Marbles, Quartzite, Bethamcherla marble stones in multi colors, shapes and size. Bethamcherla stones are basically flaggy lime stone it is natural split table and when spitted in compact slabs and tiles, Kurnool district of Andhra Pradesh has been gifted by nature with huge deposit of Bethamcherla stone. It is excellent flooring stone have been unique geo mechanical properties required for flooring stones. When polished it gives glossy finish even as good as galaxy granite. Natural stone sector has grown from an almost manual activity to a highly industrialized business in last decades.

This work examines the influence of marble as aggregate in partial and totally replacement of natural aggregate on concrete properties, which include workability of fresh concrete, impact strengths. The concrete contains different ratios of quarry dust while maintaining a constant water/cement ratio. The results of this work confirm that the natural aggregate may be replaced totally or partially with BMSA.

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 impact test. To make explore the usage of local accessible materials to the surrounding people.

II. LITERATURE REVIEW

- Chauhan Mein Wong, (2004) studied the effect of fibres in structural construction by conducting the experimental work with three different fibres like steel fibres, polypropylene, fibre mesh to enhance the mechanical properties of structural concrete. The test results showed that, the workability of concrete significantly reduced as the fibre dosage rate increases. Results of shear and impact load test indicated that the use of fibre in concrete might not efficiently increase in strength. In flexural and indirect tensile tests, specimens with fibres showed that drastic increase in strength from specimens without fibres. A moderate increase in modulus of elasticity of the fibre reinforced concrete was indicated in modulus of elasticity test. The usage of fibres were fully utilised when it comes to post-cracking stage, as it increase on ductility and toughness of concrete.
- HanifiBiniciet.al processed some experimental tests to study the mechanical properties of concrete containing lime, marble and some other stone dust. Those results are compared with natural conventional concrete. The results showed that marble stone and lime stone dust increases the workability and abrasion resistance when compared to the conventional concrete. Abrasion resistance is increased as the rate of marble stone and lime stone dust increased. Further the results are indicated that, there is an increase in sodium sulphate. resistance. With this experimental work shear strength and impact , he revealed that, the use of the marble stone and lime stone dust are gives durable for the concrete.
- S. Aravindan& C.D. Arunkumar, conducted an experimental study on fibre reinforced concrete using industrial waste. Basic object of the experimental work is to study the strength variation in concrete on addition of different quantity of Galvanized wire and copper coated wire fibres with respect to Flexure, Split tensile, Compression, modulus of elasticity and Impact energy. The main aim of the study is to know the optimum dosage of fibres used in concrete mix by comparing the test results. From the above study, it revealed that compressive, split tensile, flexure, modulus of elasticity were increases up 72

- to some percentage but impact strength almost doubled. From the study it was concluded that, 1% addition of Galvanized wire and copper coated wire was found as optimum percentage of fibres. But for Lathe scrap the addition of 2% was found as optimum percentage of fibres.

- In this investigation, it concluded that, the total energy of deformation under static loadings depends mainly on percentage of pre-stressing steel present in the section. For the beams of 101 x 152 mm in section the optimum proportion was found to be 0.48 % and for the beams of 101 x 203 mm in section it was 0.36 %. There also exists a particular proportion of prestressing steel in a given section that gives the greatest resistance to impact. For beams of 101 x 152 mm and 101 x 203 mm sections this percentage was observed to be equal and it was 0.48 %. Web reinforcement greatly affects the strength and behaviour of beams under both static and impact loadings. Web reinforcement increases the static energy of deformation, but under impact loading its function is much more important than such increases would suggest. The presence of nominal web reinforcement prevents the explosive type of failure in shear under impact loading.

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.

IV EXPERIMENTAL INVESTIGATION

The experimental program comprises casting and testing of Bethamcherla marble stone aggregate (BMSA) and Natural granite coarse aggregate (NGCA). The mix proportion details for the beams Total 90specimens were cast in which 30 beams are without fibre (0%) and remaining 60 beams are cast with 1% and 2% Fibre and with replacement of natural aggregate by BMSA of 0, 25,20,75 and 100 %. The details of each category are described below.

IMPACT LOADING TEST

This impact loading tests have been performed to compare the results with the static tests and study the influence of time of loading on the strength. This test has been carried out by using an in-house manufactured impact testing machine. The impact test machine has been planned and fabricated in accordance to the drop weight test, which was already reported by earlier researchers. The details of test setup used for conducting impact test on beams are presented below.

SPECIMEN DETAILS

Standard specimens beams are used to conduct the strength tests are taken according *to IS10086-1982*.

- The impact strength characteristics are studied, by casting the beam specimens of size 150x150x600mm.

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: Impact energy absorption value at ultimate crack recorded for each mix batch

S.No	Nomenclature of the specimen	Crack time (min)	Average No.of blows	Average energy absorption (kj)	% difference in energy absorption
1.	NGCA-0-0	1.925	306	6.76	-
2.	BMSA-25-0	0.875	275	6.06	-10.35
3.	BMSA-50-0	0.865	182	4.01	-40.68
4.	BMSA-75-0	0.680	153	3.38	-50.00
5.	BMSA-100-0	0.640	121	2.67	-60.50
6.	NGCA-0-1	3.970	349	7.69	+13.76
7.	BMSA-25-1	2.790	311	6.85	+1.33
8.	BMSA-50-1	2.050	258	5.68	-15.98
9.	BMSA-75-1	1.650	194	4.28	-36.69
10.	BMSA-100-1	1.300	138	3.05	-54.88
11.	NGCA-0-2	5.600	391	8.63	+27.66
12.	BMSA-25-2	4.920	370	8.17	+20.86
13.	BMSA-50-2	4.770	313	6.48	+2.22
14.	BMSA-75-2	3.460	239	5.27	-22.04
15.	BMSA-100-2	3.020	167	3.69	-45.41

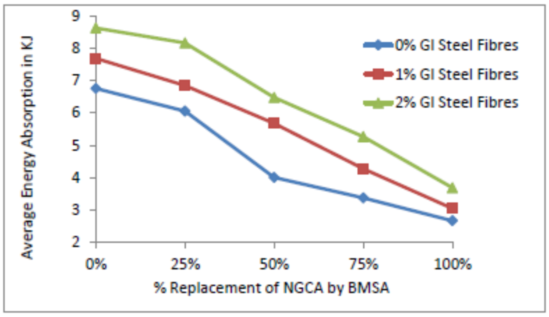

Figure: 28days Average energy absorption at Ultimate Crack Vs % Replacement of NGCA by BMSA at 0%, 1% and 2% GI Steel Fibres

The impact test results shows that the average energy absorption value, average number of blows and average crack time decreases gradually when we replace natural granite aggregate with BMSA in different proportions like 0%, 25%, 50%, 75%, and 100%. At the same it is shows that average energy absorption value, average number of blows and average crack time increases with addition of fibres. Surprisingly in this analysis replaced aggregate concrete batch gets more energy absorption value when we include 1% and 2% fibres than the control batch mix. Tables shows the average number of blows, average crack time and average energy absorption value recorded during the impact test and percentage difference of energy absorption value for all mix batches compared to control batch.

VI. CONCLUSIONS

From the above the experimental investigation it is cleared viewed that

- It is observed that impact strength of beams decreases gradually. For 0% replacement of BMSA we are getting impact strength (avg energy absorption) of 6.76 kj , after adding 1% and 2% of GI steel fibers for same mix proportion strength is around 7.69 kj and 8.63 kj respectively.
- For 25% replacement of BMSA we are getting impact strength (avg energy absorption) of 6.06 kj , after adding 1% and 2% of GI steel fibers for same mix proportion strength is around 6.85 kj and 8.17 kj respectively.
- For 50% replacement of BMSA we are getting impact strength (avg energy absorption) of 4.01 kj , after adding 1% and 2% of GI steel fibers for same mix proportion strength is around 5.68 kj and 6.48 kj respectively.
- For 75% replacement of BMSA we are getting impact strength (avg energy absorption) of 3.38 kj , after adding 1% and 2% of GI steel fibers for same mix proportion strength is around 4.28 kj and 5.27 kj respectively.
- For 100% replacement of BMSA we are getting impact strength (avg energy absorption) of 2.67 kj , after adding 1% and 2% of GI steel fibers for same mix proportion strength is around 3.05 kj and 3.69 kj respectively.
- Further increment in percent of BMSA decrement in the average energy absorption was noticed.
- But, further increment in steel fibre leads to increment in average energy absorption
- The Impact strength of the Bethamcherla marble stone aggregate beams is lower than the NGCA beam specimens and increase with increase in G.I steel fibre content.
- We can with steel fibres in building. For buildings as we take option as replacement of coarse aggregate with BMSA

REFERENCES

1. Amit rana., “Some Study on Fibre Reinforced Concrete, International journal of Emerging technology of advanced settings”, Vol 3, pp. 120-127, 2013.

2.Baboo Rai, "influence of marble powder/granular in concrete mix", International journal of civil and structural engineering. Vol., No-4. 201l, pp-827-834.6

3. BaharDemirel."The effect of the using waste marble dust as fine sand on the mechanical properties of the concrete... Internal journal of physical sciences 2010-vol.519, pp.1372- 380.

4. Etxeberria, M. Vazquez, E., Mari, A., and Barra, M. (2007), Influence of amount of recycled coarse aggregates and production process on properties of recycled aggregate concrete, Cement and Concrete Research, 37, pp735-742.

5. Satish B.D., and MukeshC.L.,(2006), Coarse recycled aggregate –A sustainable concrete solution, The Indian Concrete Journal, 82(7), pp 17-23.

6.Celebi. M., E. Samarkand N. Youssef. Members “Torsion Response of unique Building". Joumal of structural Engineering. Vol. 117. No. 5, May.1991. Page No.25846.

7. Bern Jacobsen. Erik Hjonh-Hansen. And Ivar Holamd." Cyclic torsion tests of concrete box columns, art of the journal of the structural engineering, vol-110, No.4, April-1984.pageno.803-822. 8.

8. M. S. Shetty., 2012,“***Concrete Technology*** ” ***, Theory and Practice,***S. Chand publications.