World Journal of Research and Review (WJRR)
ISSN: 2455-3956, Volume-12, Issue-2, February 2021 Pages 04-07

A Study of Effect on Mechanical Properties of Standard Concrete by Using Jhama Brick Coarse Aggregates

Ravi Sharma, Mr. Sanjeev Sipani, Dr. Vishnu Sharma

***Abstract*— Concrete is considered the world's most used construction material. Typical concrete mixtures are comprised of water, sand, cement and an aggregate of rock.Cement manufacturing industries emits 5% of global carbon di-oxide which in turns leads to the main causes for the global warming. To reduce the effects, we can replace the cement with industrial by- product like silica fume, fly-ash and so on.**

It can be understand in different aspect that it is a utilization of such waste materials in the production of a kind of useful product and also following the concept 3R's of sustainability i.e. Reduce, Reuse and Recycle of discarded or waste things in order to conserve natural resources as available on the earth, which can be further use by the future generation. This concept is exactly the base for sustainable construction.

In this project we have replaced cement with silica fume and coarse aggregates with Jhama Brick. Silica fume were used to replace 10% of cement by weight. This project presents the effects of Jhama Class Brick inclusion on the mechanical properties of concrete matrix in wet and hardened state properties. For checking mechanical properties of Jhama Class Brick bat-based concrete used partially replacement Jhama class brick to coarse aggregate ratios 0%, 5%, 10%, 15 ,and20% in M 25 grade of concrete.

***Index Terms*— Silica Fume, Jhama Brick, strength, Durability etc.**

I. INTRODUCTION

Silica fume, also known as micro silica is an amorphous (non-crystalline) polymorph of silicon dioxide. It is an ultrafine powder collected as a by-product of the silicon and ferrosilicon alloy production. It is extremely fine with particles size less than 1 micron and with an average diameter of about 0.1 microns, about 100 times smaller than average cement particles. Its behaviour is related to the high content of amorphous silica (> 90%). The reduction of high-purity quartz to silicon at temperatures up to 2,000^{o}C produces SiO_2 vapours, which oxidizes and condense in the low temperature zone to tiny particles consisting of non-crystalline silica.

For this work a jhama class brick is select as an alternative source for coarse aggregate. This material was chosen because in brick making, a large number of bricks are rejected due to non-conformity is the distorted form of brick produced due to high temperature control in the kiln. These rejected bricks can also be potential source of coarse aggregate. According to general definition concrete is a composite material so by taking advantage of the situation for the people, this paper presents the research that is carried out on the concrete when natural coarse aggregate is partially replaced by Jhama Class brick aggregate.

II. LITERATURE REVIEW

Sadam Hussain Jakhran,et.(2019) this study investigated the effect of three different coarse aggregates on the mechanical properties, durability, and microstructure of concrete. Concrete specimens were made using aggregates obtained from three regions with different mineralogy. The specimens were also made by replacing cement with silica fume. The specimens were analyzed in terms of compressive, flexural, and splitting tensile strengths, chloride penetration, carbonation, mercury intrusion porosimetry, and scanning electron microscopy. The results demonstrate that the specimens made with rougher coarse aggregates and silica fume had enhanced performance in comparison to those made with smoother aggregates.

Gurdeep Singh, Rajwinder Singh Bansal, et al (2017) In this paper we present an experimental investigation of effect of silica fume and quarry dust as partial replacements of cement and sand respectively on concrete. This effect has been studied on compressive strength, workability and durability of M25 concrete. Replacement levels of 8, 10 and 12% for silica fume and 20, 30 and 40% for quarry dust have adopted. The results of various tests conducted on control mix and other mixes with different proportions of silica fume an quarry dust have been compared. The mix with 10% silica fume and 30% quarry dust has shown better results than control concrete

Daddan Khan et. (2017) Due to the abundant usage of concrete as a construction material, there is a fast dwindling source of aggregates. There are regions where there is scarcity of coarse aggregate, so to resolve this problem, Bricks Aggregates can be used as coarse aggregate. A concrete mix ratio of 1:2:4 having characteristics strength of 3000 psi has been used in this experimental work. Compressive and tensile strength of concrete mix where 50% coarse aggregate is replaced with brick aggregate and concrete mix where 100% coarse aggregate is replaced with brick aggregate and addition of silica fume as a supplementary cementing material have been evaluated at 7, 14 and 21 days of age. The experimental test results revealed the compressive and tensile strength of concrete where coarse aggregate is replaced at

Ravi Sharma, M.Tech Research Scholar, Department of Civil Engineering ,YIT, Jaipur
Mr. Sanjeev Sipani, Professor, Department of civil engineering, YIT, Jaipur
Dr. Vishnu Sharma, Professor, Department of civil engineering, YIT, Jaipur

50% is almost the same as that normal concrete at the 7, 14, 21 and 28 days.

LakhbirSing, Arjun Kumar, et.(2016) The use of silica fume had major impact on industries, ability to routinely and commercially produce silica fume modified concrete of flow able in nature but yet remain cohesive, which in turn produces high early and later age strength including resistant to aggressive environments. This study is an experimental on the nature of silica fume and its influences on the properties of fresh concrete. The partially replacement of cement by silica fume the strength parameters of concrete have been studied. First the strength parameters of concrete without any partial replacement were studied then strength parameters by partial replacement with silica fume have been studied by placing cube and cylinder on compression testing machine. Silica fume were used to replace 0% to 15% of cement, by weight at increment of 5% for both cube and cylinder. The results showed that partial replacement of cement with silica fume had significant effect on the compressive strength of cube and split tensile strength cylinder. The strength of concrete increases rapidly as we increases the silica fume content and the optimum value of compressive strength is obtained at 10% replacement. After 10% its start decreasing under uniform load condition of 4 KN and similarly the split tensile strength increases up to 10% and then start decreasing under the uniform load condition of 2KN.

III. METHODOLOGY

1. Procurement of material like sand,cement, aggregates and replacement material like silica fume and jhama brick.
2. Determine the properties of each and every ingredients of concrete like specific gravity, water absorbtion, etc.
3. To perform Mix design calculation with alternate material by following IS10262:2009.
4. Perform experiments to determine compressive, spilt tensile and flexure strength of concrete.
5. Perform durability test of concrete.
6. Obtained conclusion from the results of experiment.

4.RESULT AND DISCUSSION

A. Workability of Concrete

Table 4.1: Compaction Factor of Concrete w.r.t Silica fume and jhama brick aggregates

Jhama brick Percentage	Compaction Factor
0%	0.93
5%	0.89
10%	0.87
15%	0.84
20%	0.82

B. Slump Test

Table No. 4.2 Slump for Control mix of M25

S. No.	Control Mix	Slump (mm)
1	M25	75

Table No. 4.3 Slump with 10% Silica fume and Jhama brick aggregates

S. No.	Jhama Brick Aggregates %	M25
1	0	70
2	5	68
3	10	64
4	15	61
5	20	59

C. Compressive Strength of Concrete

Table 4.4 Compressive strength of M25 grade

Jhama Brick Aggregates%	Compressive Strength(N/mm2)	
	14 Days	28 Days
0	21.4	26.82
05	23.7	29.93
10	26.9	33.64
15	27.85	34.82
20	22.2	27.7

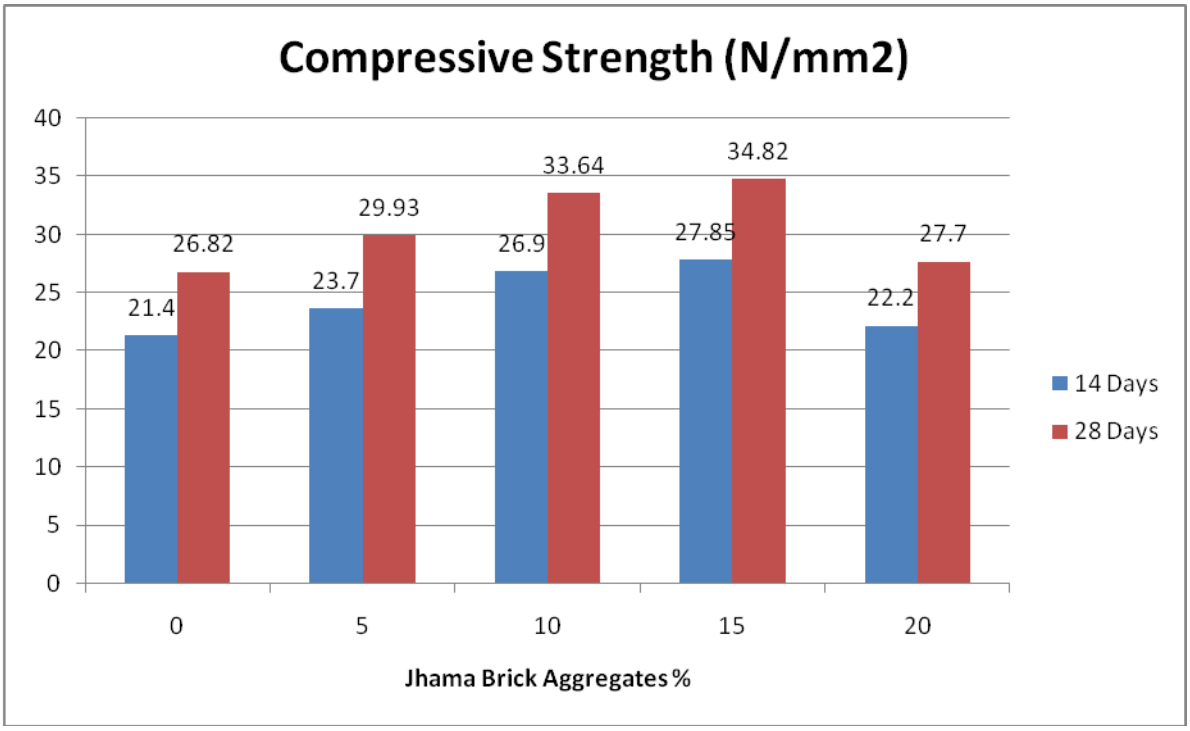

Fig 4.2 Comparative Compressive Strength of M25 Grade

D. Split Tensile Strength of Concrete

Table 4.5 Splitting Tensile Strength of M25 grade

Jhama Brick Aggregates%	Splitting Tensile Strength(N/mm2)	
	14 Days	28 Days
0	1.79	2.24
5	1.94	2.41
10	2.18	2.73
15	2.6	3.26
20	1.8	2.27

E. Flexural Strength of Concrete

Table 4.6 Flexural Strength of M25 grade

Jhama Brick Aggregates%	Flexural Strength (N/mm2)	
	28 Days	Percentage Increased
0	2.6	-
5	2.9	11.53
10	3.3	26.92
15	3.4	30.77
20	2.7	3.84

IV. CONCLUSION

From the study it was observed that compressive strength increased as increase the percentage (%) of Jhama Brick Aggregates(0% to 15%) after 15% compressive strength decreases for both 14 days & 28 days cube strength. it was also observed that optimum percentage increment in compressive strength of concrete was 32.3% for 14 days curing and 39.6% after 28 days curing (from 0% to 15% addition of Jhama Brick Aggregates).

The optimum percentage increment in split tensile strength was 22.23% for 14 days curing at 10% and 23.72% for 28 days at 5% Jhama Brick Aggregates.

It was also noted that flexural strength of concrete increase gradually with addition of Jhama Brick Aggregates and minimum flexural strength was obtained at 0% (2.7 N/mm2). 3.38 N/mm2 optimum flexural strength was obtained with addition of 10% Jhama Brick Aggregates after 28 days of curing.

REFERENCES

[1] Kim, Seong&Qudoos, Abdul &Jakhrani, Sadam& Lee, Jeong& Kim, Hong Gi. (2019). Influence of Coarse Aggregates and Silica Fume on the Mechanical Properties, Durability, and Microstructure of Concrete. Materials. 12. 3324. 10.3390/ma12203324.

[2] Pradheepa, S. Karthick(Volume: 07 Issue: 12 | Dec 2020) "STUDY ON PARTIAL REPLACEMENT OF CEMENT BY SILICA FUME AND FINE AGGREGATE BY STEEL SLAG"P-ISSN: 2395-0072.

[3] Laghari, Abdul. (2018). Replacement of Coarse Aggregate with Locally Available Brick AggregateEngineering,Technolog& Applied Science ResearchVol. 7, No. 6, 2017, 2266-2267