



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 6, June 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118



9940 572 462



6381 907 438



ijirset@gmail.com



www.ijirset.com

Mechanical Properties of Concrete with Partial Replacement of Fine Aggregate by Clay Brick Masonry Wastes

Mr.P.Vijay, Amirtha Lakshmi G, Gomatheswaran J, Kirthaana S

Guest Lecturer, Department of Civil Engineering, Anna University Regional Campus, Madurai, India

Students, Department of Civil Engineering, Anna University Regional Campus, Madurai, India

ABSTRACT: In construction industry, concrete is most essential in terms of strength and durability. Concrete is made of construction materials such as fine aggregate, coarse aggregate and cement. In other hand, the performance of such aggregates directly impact on strength. To overcome the demand and cost of fine aggregate, clay brick masonry waste can be a best partial replacement. Hence, the demolished construction waste can be recycled and used, which may also lead to the use of wastes without dumping it. The replacement by 0%, 20% and 40% of fine aggregate by clay brick masonry waste in concrete were examined in this study.

KEY WORDS: Clay brick masonry waste, demolished waste, recycled aggregate, concrete.

I. INTRODUCTION

The construction industry keeps developing day by day. Due to rapid urbanization, and infrastructure development, the need of concrete is also competing. The construction materials sources are renewable and cost is also high. In order to overcome this, we need to opt for any alternative sources for aggregates. The replacement of aggregate partially or fully in concrete may reduce the demand of aggregate. There is a also possibility, aggregates replacement may show good strength and durability compared to conventional concrete. As we all know, the cost of fine aggregate is increasing day by day. It is necessary to find an alternative to face this financially and also to save mother earth from devastating it. Mostly, we need to transport aggregates from distance, so demolished wastes could be easier in case of transportation due to local availability. Also, scarcity of fine aggregates is also a major problem. In this study, the fine aggregates replaced by clay brick masonry waste percentages such as 20% and 40% were discussed.

II. LMATERIALS AND METHODOLOGY

The raw materials used throughout the project were fine aggregate-Msand, angular coarse aggregate of size 20mm and OPC cement of grade 43, locally available tap water from Anna university Regional Campus was used. The mechanical properties of all the raw materials were examined completely and the results are tabulated below.

Table.1 TEST ON MATERIALS

TEST	MATERIALS			
	Cement	Coarse Aggregate	Fine Aggregate	Recycled Aggregate
Specific Gravity	3.16	2.73	2.46	2.32
Water absorption	-	1.5	2.5	5.15

Fineness modulus	-	4.46	3.25	2.82
Dry rodded density	-	1574.3Kg/m ³	1731.69Kg/m ³	

MIX DESIGN AND PROPORTIONING

The grade used in their study was M 25. The water cement ratio is 0.5 and the cement content was 348.32 kg/m³. The batches of concrete were in two different percentages. The quantity of cement, Fine aggregate and Coarse Aggregate and recycled aggregate is tabulated below

Table.2 MIX PROPORTIONING

MATERIAL	PER CUBE (kg)	PER CYLINDER (kg)
Cement	1.87	2.93
Coarse aggregate	4.02	6.32
Fine aggregate	1.66	3.15
20% of recycled aggregate	0.4158	0.106
40% of recycled aggregate	1.24	1.304

CASTING OF SPECIMENS

(i) MIXING

The mixing of concrete is done in a controlled environment. The raw materials are poured in and mixed well with a trowel without leaving it to set.



Fig.1 Mixing of concrete

(i) CASTING

Cube moulds of size 150mm x 150mm x 150mm and cylinder moulds of size 150mm x 300mm were cleaned thoroughly, all the sides of the mould were oiled. Next, the ready mixed concrete is damped frequently with a damping rod to get an even size and shape of the specimens. After filling with hand made ready mix concrete, the moulds were kept under room temperature for 24 hours to dry.



Fig.2 Cube and cylinder casting

(ii) CURING

After 24 hours of drying, the cubes and cylinders were demoulded and immersed in clean water for 7, 14 and 28 days. It is must to take out the specimen from curing tank and air dry day it before testing.



Fig.3 Curing

RESULTS AND DISCUSSION

The strength & durability of nominal concrete is compared with conventional concrete. The tests were done after 7, 14 & 28 days of curing. The strength of different percentage with water binder ratio 0.5 is discussed below

(i) COMPRESSIVE STRENGTH

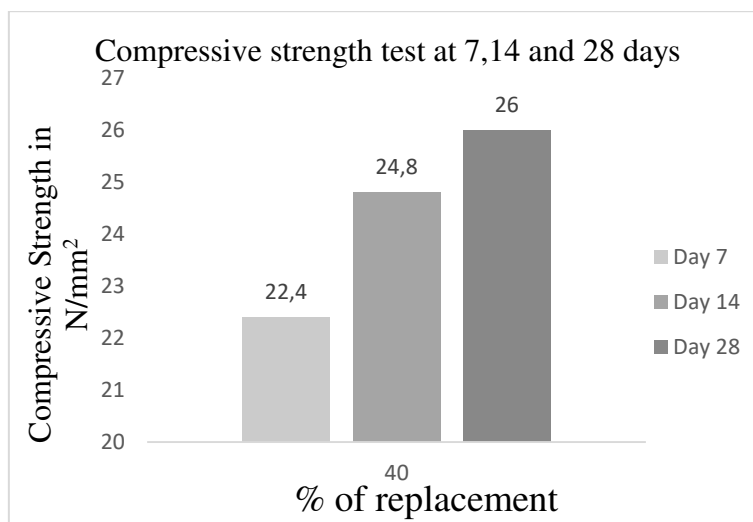
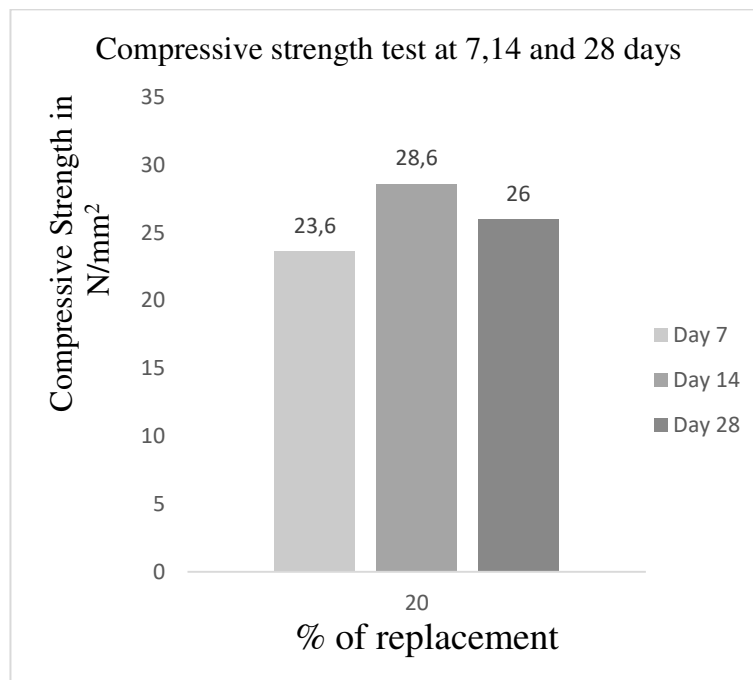
The compressive strength test was conducted in CTM (compression testing machine). The procedure was done as per the guidelines, the required specimen was placed horizontally and the load is applied. The load at failure is also noted and compared.



Fig.4 Compressive strength test

Table .3 COMPRESSIVE STRENGTH TEST RESULTS

% of replacement	7 days	14 days	28 days
0%	16 N/mm ²	19.2 N/mm ²	26 N/mm ²
20%	23.6 N/mm ²	28.6 N/mm ²	34 N/mm ²
40%	22.4 N/mm ²	24.8 N/mm ²	33.5 N/mm ²

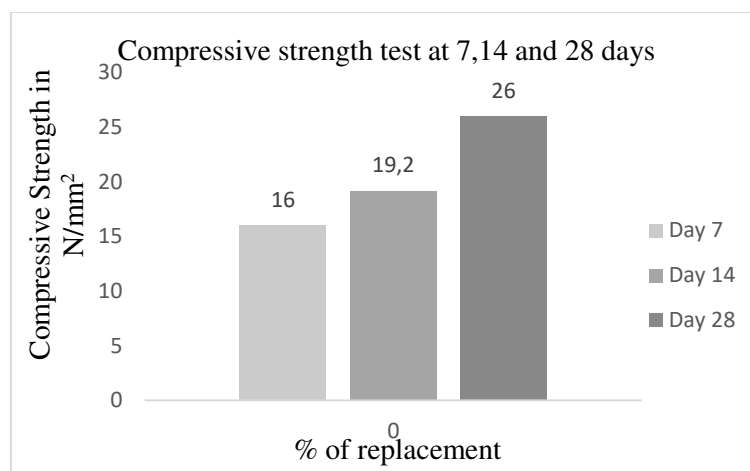


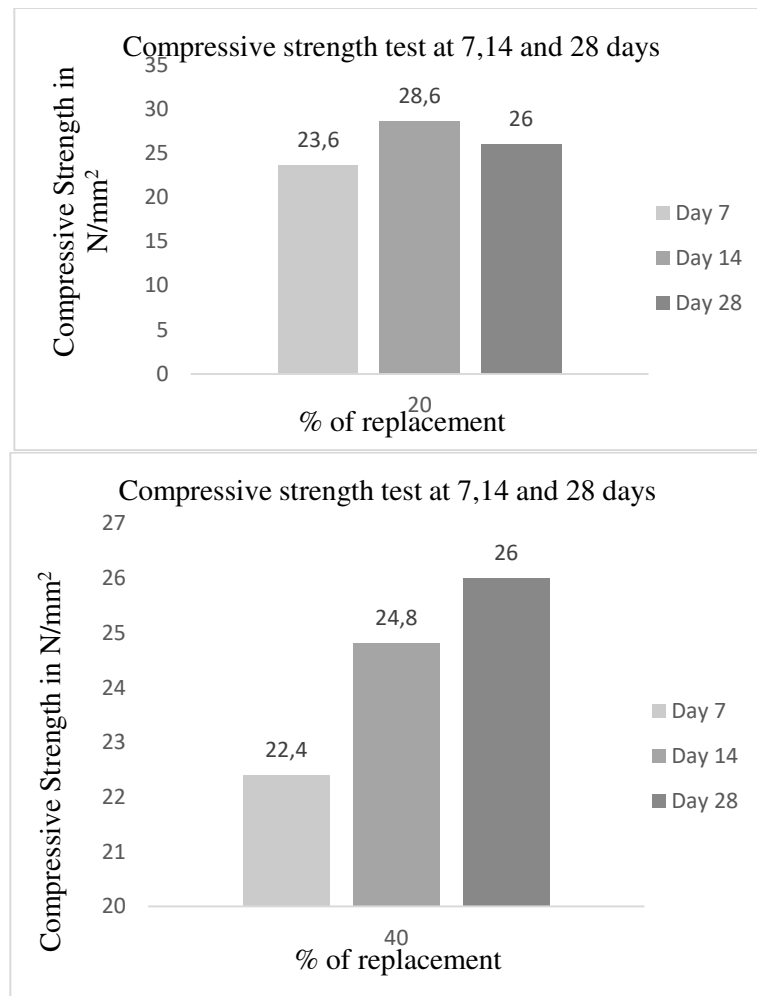
(ii) **SPLIT TENSILE STRENGTH TEST**

This test was conducted in UTM (universal testing machine). The test was conducted as per the guidelines. The specimens were placed horizontally and the load was applied from both the direction and the failure load is noted. The strength of specimens were discussed.

*Fig.5 Split tensile strength test***Table.4 Split tensile strength test results**

% of replacement	7 days	14 days	28 days
0%	2.04 N/mm ²	2.5 N/mm ²	2.6 N/mm ²
20%	2.38 N/mm ²	2.5 N/mm ²	2.78 N/mm ²
40%	2.6 N/mm ²	2.36 N/mm ²	2.61 N/mm ²





III. CONCLUSION

1. From the above test results it is true that , clay brick masonry waste can be a best replacement for fine aggregate.
2. Its concluded that 20% of clay brick masonry waste ensure high compressive and split tensile strength compared to nominal concrete.
3. It is recommended to use 15% - 35% of clay brick waste in concrete as substitute for fine aggregate.
4. Moreover, the disposal of wastes will be reduced and it will be properly reused.
5. Also, the scarcity of fine aggregate wont be a problem, brick wastes are easily available.

REFERENCES

1. C. Medina ,W. Zhu , T. Howind , M. Frías , M.I. Sánchez de Rojas ,Effect of the constituents (asphalt, clay materials, floating particles and fines) of construction and demolition waste on the properties of recycled concretes, Construction and Building Materials 79 (2015) 22–33.
2. Dingyi Yang, Miao Liu, Zhiming Ma, Properties of the foam concrete containing waste brick powder derived from construction and demolition waste, Journal of Building Engineering (2019)2319.
3. Shahiron Shahidana, Mohamad AzimB , Kumaran Kupusamyc Sharifah Salwa Mohd Zukid , Noorwirdawati Ali Utilizing Construction and Demolition (C&D) Waste as Recycled Aggregates (RA) in Concrete Procedia Engineering 174 (2017) 1028 – 1035.



4. Zhenhua Duan , Amardeep Singh , Jianzhuang Xiao , Shaodan Hou, Combined use of recycled powder and recycled coarse aggregate derived from construction and demolition waste in self-compacting concrete. Construction and building materials 254 (2020) 119323.
5. Jianzhuang Xiao , Zhiming Ma , Tongbo Sui , Ali Akbarnezhad , Zhenhua Duan, Mechanical properties of concrete mixed with recycled powder produced from construction and demolition waste Journal of Cleaner Production 12535.
6. Juntao Dang , Jun Zhao , Wenyan Hu , Zhaohua Du , Danying Gao , Properties of mortar with waste clay bricks as fine aggregate, Construction and Building Materials 166 (2018) 898–907.



INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.118



ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details