



Characteristic of Physical and Mechanical properties of Sustainable building brick using demolition waste dust and cement

¹Tomar Akhilesh R, ²Arjun M Butala,

¹Mtech Student, ²Assistant Professor,

¹Department of Civil Engineering,

¹U.V.Patel College of Engineering, Mehsana, India

Abstract: Ordinary Portland cement (OPC) is the main component for the concrete production in the construction industry. In the major project study has been undertaken to investigate the use of demolition waste dust and cement for the manufacturing of the brick. Standard consistency and initial and final setting time are tested for binder mix. Mechanical properties such as compressive strength for 7 days is found out. Durability properties such as water absorption are evaluated at 7 days. The proportion of cement and demolition waste dust are 20%, 30%, 40% and 50%.

Index Terms – Demolition waste dust, cement, Compressive Strength, Water Absorption, Efflorescence test.

I. Introduction

Ordinary Portland cement (OPC) is the main component for the concrete production in the construction industry. The demand of brick is increasing day by day. Brick is the main component in the construction industry for masonry work. Demolition waste dust generated due to dismantling the concrete structure. The present research is performed to study the properties of brick manufactured from demolition waste dust and cement. The study is expected to provide some information regarding the suitability of demolition waste and cement for used in the construction industry. The compressive strength of brick is done at 7 days. The mix design were adopted are 20% cement + 80% demolition waste dust, 30% cement + 70% demolition waste dust, 40% cement + 60% demolition waste dust, 50% cement + 50% demolition waste dust. This research will reduce the demolition waste dust entering to the municipal solid waste which will reduce the land pollution.

II. MATERIALS

2.1 Cement

43 grade ordinary Portland cement is utilized for the experimental work. cement used in the experimental work is shown in figure 2.1. Cement is used a binding material in the construction industry. In our project OPC cement is used and the property is mentioned below in table 2.1.

Table: 2.1 Physical properties of the OPC

Sr No	Particulars	Results (IS 12269-1987)
1	Specific gravity	3.10
2	Initial time (min)	30 min
3	Final Time (min)	600 max
4	Normal consistency (%)	30



Figure: 2.1 Cement

2.3 Demolished Concrete Dust

Demolished Concrete Demolition waste dust generated due to dismantling of the structure. In 2016 150 million tonnes of construction waste generated in india, from that that 50% is generated from small towns. The size of demolition waste dust is used which can pass from 4.75mm seive and retain on 600 micro seive. Demolition waste dust collected from Ahmedabad environ project Pvt Ltd site which is located near narol Gujarat. Recycling of construction waste starts with segregation of unwanted materials such as plastic, wood, metal etc and then the remaining material were put on the crushing machine and crush the material as per required size. Demolition waste dust have specific gravity of value around 2.40.



Figure 2.2 Demolition waste dust

III. METHODOLOGY

Procedure:

The demolition waste dust were sieved by using 600 micron sieve. The Demolition waste dust and the waste cement were weighed in various proportions. After weighing cement and demolition waste were mix with the help of water. There are mainly two types of mixing. Hand mixing and machine mixing in this project we adopt hand mixing. After properly mixing the mixture were pour into the mould. DeMoulding were done after 24 hours. The specimen were kept in the curing tank for 7 days. The bricks of 190mm x 90 mm x 90 mm are casted with different mix proportions. The different mix design has been made in below table3.1.

Table: 3.1 Different mix proportions of brick

Sample No	Cement	Demolition waste Dust
A	20%	80%
B	30%	70%
C	40%	60%
D	50%	50%



Figure: 3.1 bricks

IV. RESULTS

4.1 Compressive Strength

The Compressive strength of bricks is determined by placing brick in compression testing machine. The universal testing machine of capacity 3000 KN is used for testing the compressive strength of the brick. Compressive strength of the brick is calculated after 7 days of curing. From the result it seems that compressive strength is increases gradually by adding cement into the mix.

Table: 4.1 Table of Compressive Strength of Bricks

Sample No	Compressive Strength N/mm ²
A	2.42
B	3.36
C	5.84
D	6.74



Figure: 4.1 Compressive Test Machine

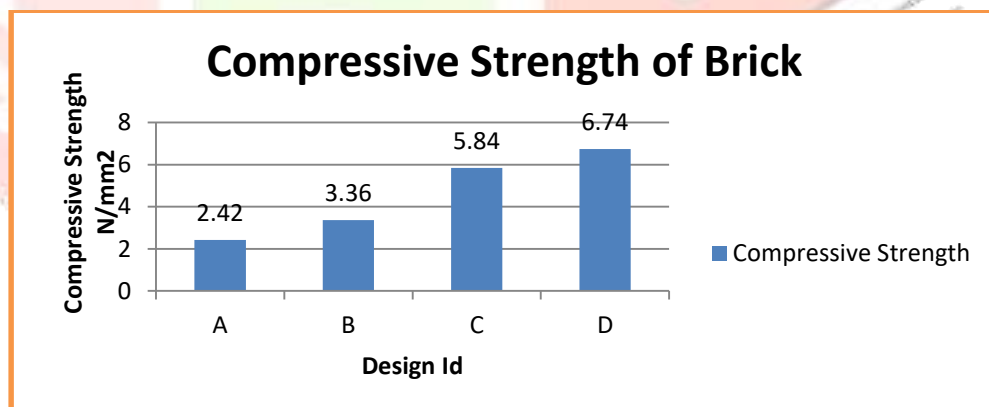


Figure: 4.2 Compressive Strength of Bricks

4.2 Water Absorption

In the water absorption test weigh the dry brick(W1). After weighing immersed the brick in to the water for 24 hours at a temperature of 27+/- 20°C. Remove the brick from the container and wipe out the water from the brick and weighed (W2). Water absorption is calculated by $W2-W1/W1*100$. Water absorption for different ratio waste cement and Demolition waste dust is shown below in the table. Water absorption is found to be more at at sample no D.

Table: 4.2 Table of Water Absorption of bricks

Sr No	Sample No	Water Absorption (%)
1	A	9.93
2	B	9.74
3	C	9.66
4	D	10.66

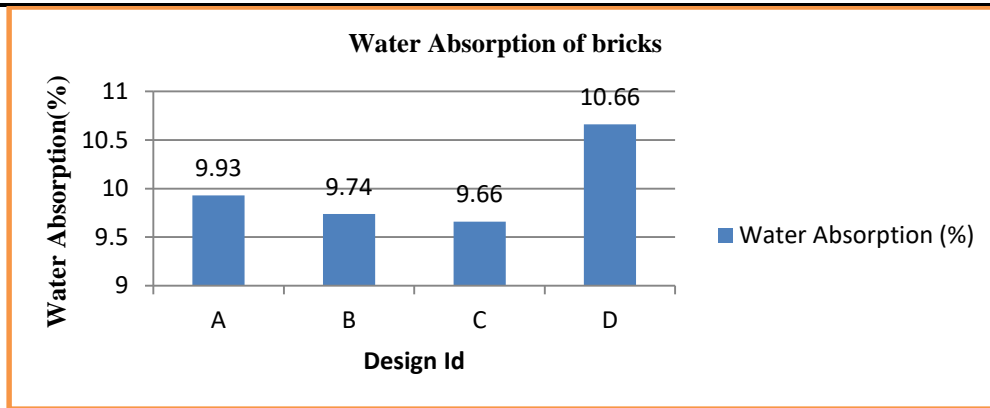


Figure: 4.3 Water Absorption of brick

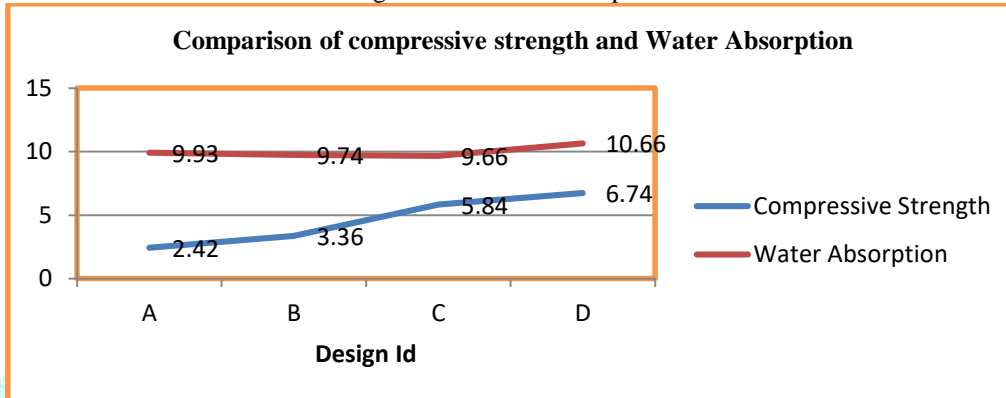


Figure: 4.4 Comparison of bricks

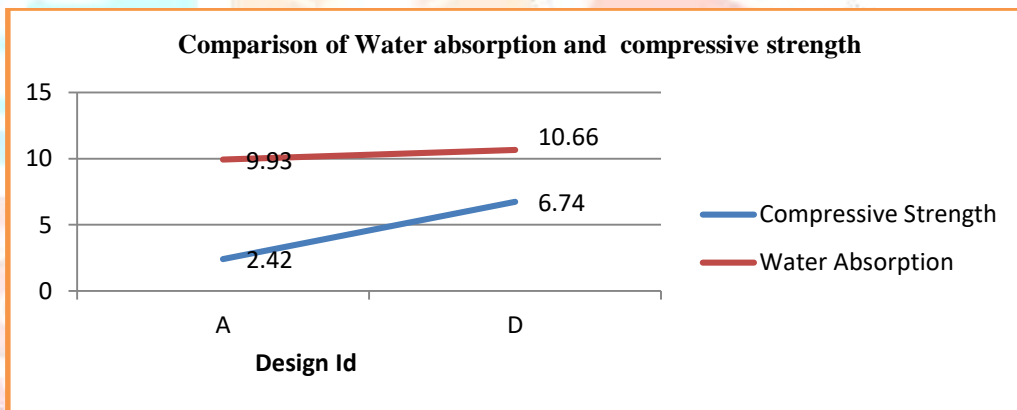


Figure: 4.5 Comparison of Water absorption and compressive strength of Sample A and D

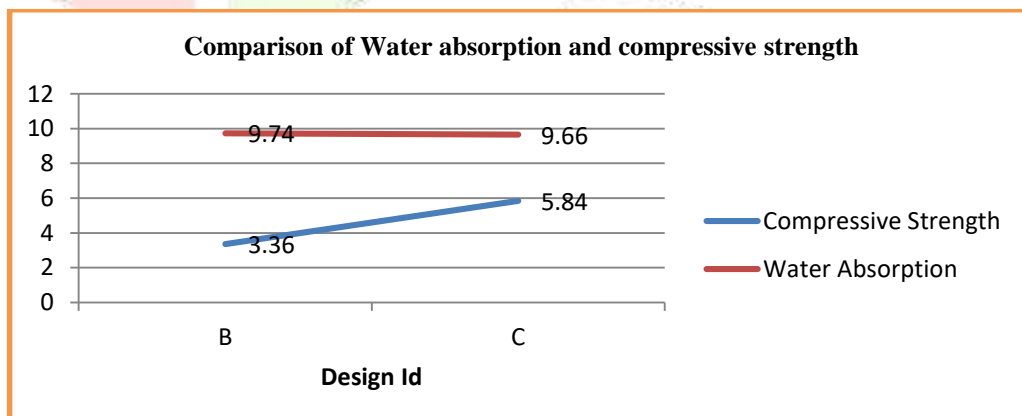


Figure: 4.6 Comparison of water absorption and compressive strength of sample B and C

4.3 Efflorescence Test

Efflorescence is a crystalline, salty deposit that occurs on the surfaces of bricks and other masonry products. The whole test procedure is conducted as per IS: 3495-1976. There is no noticeable deposit found in the brick. The Efflorescence results are found to be nil in all the bricks.

4.4 Dimensional Tolerance

Twenty number of brick sample is consider for the conduction of dimension tolerance test as per IS 1077-1992. All the test procedure is followed as per IS 1077-1992. Dimension tolerance result is found to be OK as per IS 1077-1992.

Table: 4.3 Table of Dimensional Tolerance

Width (mm)	Height (mm)	Length (mm)	Dimensional Tolerance as per IS 1077-1992
1797.6	1798.0	3852.0	Length=3800+/-80mm Width=1800+/-40mm Height=1800+/-40mm

V. CONCLUSION

The bricks with the 50% + 50% of demolition waste dust and cement have the highest compressive strength. The bricks with the 50% +50% Rice demolition waste dust and cement have the highest the Water Absorption. The water absorption and compressive strength increases as increases the percentage of cement content. From the result of compressive strength it seems that bonding between cement and demolition waste dust is becomes strong as we increases the percentage of cement content. The Efflorescence result is found to be nil in all the bricks.

REFERENCES

- [1]. Manish Kumar sahu and Lokesh singh, "Critical review of bricks type 14: plastic and sand bricks", International journal of mechanical and production engineering ISSN :2320-2092 volume 5, issue 11 Nov -2017.
- [2]. Sunil Chavan, Shubham Tanhane, Mukesh Chavan, Rushikesh Phuge, Mayur Tanpure, Manoj Deosarkar, "Manufacturing of pavement block by using waste plastic and sea sand" (IJRSET) ISSN 2347-6710 volume 8, issue 14 april 2019
- [3]. Lairenlakpam Billygraham singh, Pongsumbam boss singh, Loukham Gerion singh, Suresh Thokehom, "Manufacturing of brick from sand and plastic" (IJETMAS) ISSN 2349-4476 volume 5, issue 3 march 2017.
- [4]. Aiswaria k, Khansa Abdulla, E B Akhil, Haritha Lakshmi V G, Jerin Jimmy, "Manufacturing and Experimental Investigation of brick with plastic and M-sand" (IJRSET) ISSN 2319-8753 volume 7, issue 6 june 2018.
- [5]. Manhal A Jibrael, Farah Peter, "Strength and behavior of concrete contains waste plastic" Journal of ecosystem and ecography ISSN : 2157-7625 volume 6, issue 2 may 31 2016.
- [6]. R. Mahadevi, S. Abirami, P. Jananipriya, J. Karunya and M. sakthipriya, "An experimental investigation on concrete paver block by using pvc plastic material" (IJMTER) ISSN: 2349-9745 volume 5, issue 3 march 2018.