Advanced Science Letters
E-ISSN:1936-7317

APPLICATION OF PAINT WASTE IN PRODUCTION OF SUSTAINABALE BRICKS

[1]*M. Rajasekhar* , [2]*B. Arun Kumar*, [3]*G. Nishitha* , [4]*K. Sai Sumanth* , [5]*K. Sai Praneetha*
[1]*Assistant professor, Department of Civil Engineering*
St. Martin's Engineering College, Dhulapally, Hyderabad, Telangana, India.
Email: rajasekhar.makala@gmail.com
[2,3,4,5]*JNTUH Student, Department of Civil Engineering*
St. Martin's Engineering College, Dhulapally, Hyderabad, Telangana, India.

Abstract: Today, Urbanization has evolved as a major requirement in many countries. This feature adds beauty and life for a locality or a region. In this process, a major challenge locks the horns, that is renovation or demolishment of old and weak buildings. This is paving the way towards the accumulation of construction waste in the Environment. Paint is also observed to be one of the by-products of this Construction Waste. Paint material has got nothing to after the structure is collapsed or removed, but simply prevailing as a scrap. This project has come up with an idea of recycling the Solid Paint Waste in the construction industry to attain sustainability. Therefore, this project aims to create the Bricks made with the replacement of Solid Paint Waste as a replacing material for Fine Aggregate, at 0, 25, 30, 35, 50 and 100 percentages and assess the strength properties. The optimistic amount of replacement is analyzed and reported.

Key Words: Bricks, Fine Aggregate replacement, Solid Paint Waste, Strength Properties.

I. INTRODUCTION:

A brick is a man-made building material used to make walls and make places to walk. It is a single unit of kneaded clay -bearing soil, sand and lime, or concrete material, fire-hardened or air-dried, used in masonry construction. Bricks are made mostly of clay. They are put into molds or cut with wires, and then baked in an oven. The color of a brick depends on the clay from which it was made. Masons build brick walls. They join bricks together using mortar. Bricks can be assembled into many different patterns. The most common pattern is called "running bond". A row of bricks is called a course. A wall that is just one brick thick has one Wythe. Bricks used outdoors on the ground are called "pavers". Engineering bricks are used for high load-bearing walls, and for damp=proof courses. They are more expensive, and are made of better clays and fired at a higher temperature. Officially, the term brick is used to denote a building unit made of shaped clay, but in modern times it is used to refer to any stone- or clay-based building unit that is joined with cement mortar when used in construction. Typically, bricks are about 4 wide, 8 inches long, with a variety of thicknesses. Larger stone- or

clay-based building units of the type used in foundations are usually called blocks.

There are a number of ways that brick can be categorized. For example, you can divide brick into the types used for facing (exposed and visible on the exterior of a structure) vs. backing bricks (which are used structurally and are hidden from view). Another means of categorizing brick is according to how they are manufactured: unfired (brick that is air-cured) and fired (brick that is baked in ovens in order to harden it). Bricks can be also categorized according to their typical use: common bricks or engineering bricks. For purposes of residential construction, it is usually common bricks that are of most interest, since engineering bricks are more often used in civil engineering projects, such as road or bridge construction, or in sewers construction.

A). Objectives:

- To analyse characteristics of Cement Bricks.
- To manufacture Bricks by replacing the Fine Aggregate with Solid Paint Waste at various percentages.
- To find the optimistic and economical amount of Solid Paint Waste to attain the maximum strength of Brick.

B). Brick:

Basically, Brick is a simple and elementary construction material which is used in almost all the components of the structures, including walls, footings, lintels etc., The **Fig: 1** Presents a Brick.

Fig-1: Brick

II. MATERIALS.

A). Cement.

We used Ordinary Portland Cement (OPC) 53 Grade for all the specimens in this study.

Table:1: Specifications of cement

Material/ Specification	Cement
Specific Gravity	3.14
Normal Consistency	32%
Initial Setting Time	22mins
Final Setting Time	406mins
Fineness	96%
Compressive Strength	52.56 Mpa

B). Fine Aggregate:

The aggregate which will pass through 4.75 mm IS sieve and entirely retained on 75 µ sieve is considered as fine aggregate [6]. Quarry sand is used as fine aggregate in our project. Specific gravity of fine aggregate is 2.43

C). Water:

Water is the main ingredient used to mix all the contents. Potable water is used as usage of any other water may contain salts and cause decrease in strength of concrete [3].

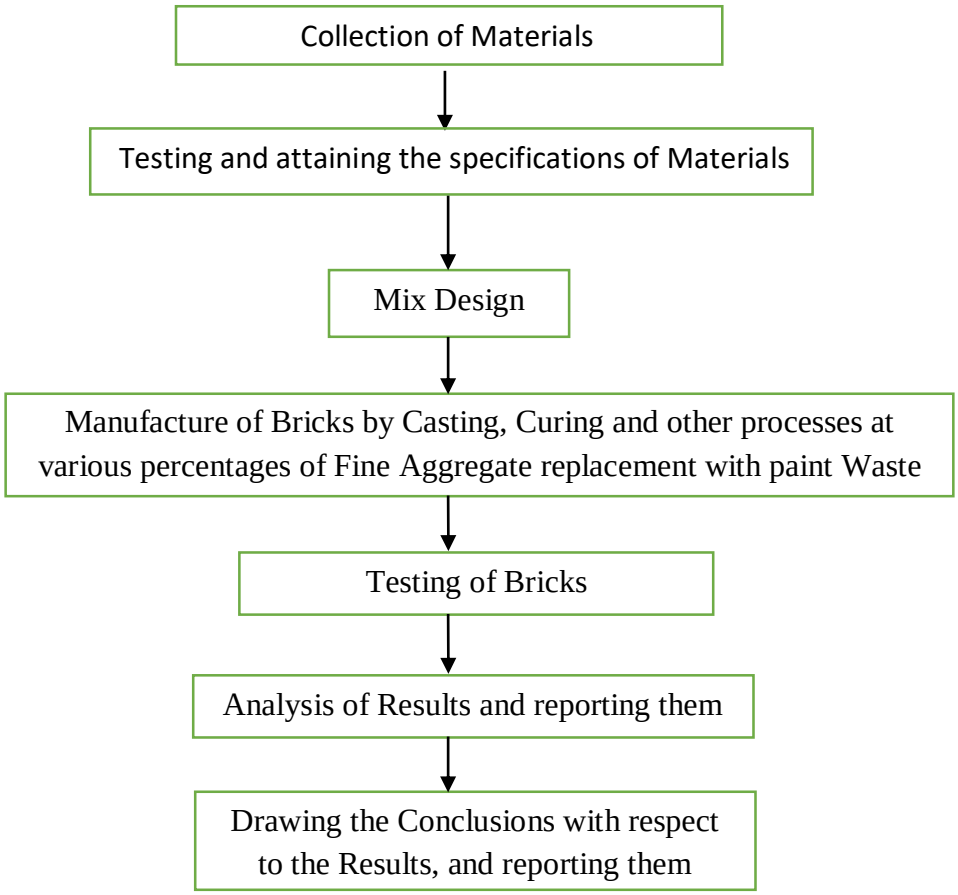
D). Fly Ash:

In simple words, Fly- Ash is an ash produced in small dark flecks by the burning of powdered coal or other materials and carried into the air. The Chemical Composition of the Fly- Ash would be Calcium Oxide, Calcium Hydroxide, Silica Fume, Calcium Silica Hydrate etc., [1]. The Fly-Ash in this project is used as a replacing material for cement for upto 15%, and it is collected from the nearby Fly-Ash Brick Manufacturing Industry.

E). Solid Paint Waste:

Paint is one of the materials generally applied for the structures to resist the atmospheric effects on the structure and improves aesthetics. This material occurs in liquid form and hardens upon application. For this project, Solid Paint Waste from an old demolished structure is attained and is used as a replacing material for Fine Aggregate at various percentages.

III. METHODOLOGY



A). Manufacture of Bricks:

As this study aims to Manufacture Cement Bricks, by replacing the Fine Aggregate in it, using Solid Paint waste at various percentages, the process below explains the process of manufacture of these Bricks. For this project,

- The Cement, Fine Aggregate ratio is considered as 1:3 (Since, this ratio is used practically during the manufacture of Cement Bricks).
- The Water Cement Ratio is taken as 0.5 (With respect to Normal Consistency and to achieve a proper Workability and Strength)
- The Cement is replaced with Fly- Ash for about 15%
- The Fine Aggregate is replaced with Solid Paint Waste at 0, 25, 30, 35, 50 and 100 percentages.

B). Casting of Specimens:

- Firstly, all materials are batched according to the mix design obtained
- Cement Mortar is prepared by mixing well by Hand Mixing at various percentages of replacements. Mixing is done until a homogenous mix is attained.
- Brick Moulds of dimensions 220 * 100 * 80 mm as shown in Fig: 2 are arranged and oiled properly to obtain smooth surface,
- Cement Mortar is now placed in mould in 3 layers into the mould.
- Each layer is tampered properly with 25 even blows for every layer by using tamping rod, and also placed on Hydraulic Concrete Vibrating table for 15secs.
- Finally, the Surface is levelled and left undisturbed for 24 hours, as shown in Fig:3.
- After brick is hardened, the specimens are unmoulded and curing will be done.

Fig: 2: Brick Moulds

Fig: 3: Casted moulds

C). Curing of Specimens:

Pond curing is adopted for curing of these specimens for a period of 7, 14, 28 days, as shown in **Fig:4.** Once, the Curing period is done for the specimen, it is further moved for testing process that includes, Compressive Strength Test.

Fig: 4: Curing of Bricks

IV. TESTING OF SAMPLES

A). Compression Test Results:

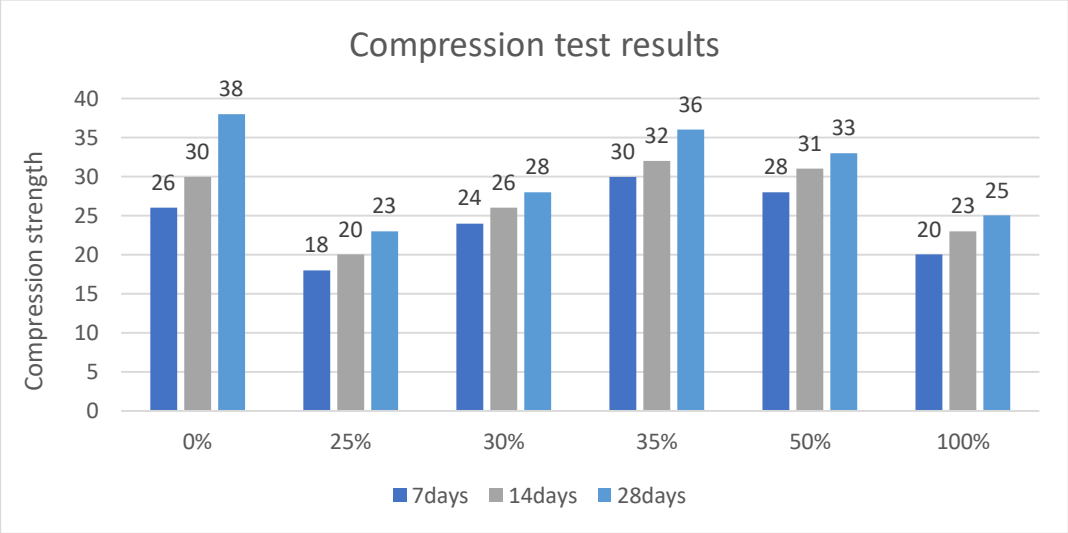
The brick samples were tested in a compressive testing machine having 2000kN, and landed at a constant rate of loading at 200kg per minute as per Indian standard procedure for the bricks. The Fig:5 below presents the Typical Compressive Strength machine. The specimen after being introduced in the Compression Testing Machine, the loading will be started. The maximum load at which the specimen fails is noted (KN).

Fig: 5: Compression testing Machine

Table-2: Compression Test Results:

Percentage of Replacement of Fine Aggregate	**Compressive Strength (N/mm^2)**		
	7 days	**14 days**	**28days**
0%	26	30	38

25%	18	20	23
30%	24	26	28
35%	30	32	36
50%	28	31	33
100%	20	23	25



Graph-1: comparison of compression test results

Analysis of Compressive Strength Test Results:

- On 0% replacement of Fine Aggregate with Paint, it is observed that, by the end of 28days, 38N/mm^2 compressive Strength is observed.
- Whereas, at 100% replacement, highly unsatisfactory results are noticed, with a compressive strength of 25N/mm^2 which is even lesser than 7days strength of 0% replacement.
- Observing the 25%, 30% and 35% replacements, it is observed that, there is a steep growth in terms of strength. By the end of 28days, for 35% replacement, a compressive strength of 36N/mm2, which is closer to 0% replacement strength.
- After 35% replacement, there is again downfall in terms of strength, and at 50% replacement, the strength is observed as 33N/mm^2
- Finally, at 100% replacement, the strength fell down drastically.
- Therefore, from this analysis, it is observed that, at 35% replacement of Fine Aggregate with Solid Paint Waste, the strength is really satisfactory and optimistic

V. CONCLUSIONS.

- Solid paint waste is considered as comparatively light weight fine aggregates and gives strength to bricks.
- As in creases in the percentage of replacement of paint waste the strength also gets increases and density is decreased.
- For 25 % is found to be better substitute for cement brick with respect fine aggregates (sand)
- The 30% replacement of paint waste is considered as the best in view of strength and economy; hence we use it in moderately loaded structures
- 35% replacement of paint waste can be used wherever the lack of normal bricks.

Recommendations and Scope for Further Studies:

- Since, this study had only used 1:3 (Cement: Fine Aggregate) ratio, further studies can also be made by other proportions.
- Further observations can also be done by other Water Cement Ratio, that is 0.4, 0.35, 0.6 etc.,
- Addition of admixtures can enhance the properties of the brick, to increase the strength and setting times.
- Few other tests can also be done including Water Absorption, Drop Test can also be done on the same samples.
- To use in the construction, a frog should be added on the Bed side of the brick to ensure better bond.
- By developing this model, it can pave a way towards consumption of lesser amount of Fine Aggregate and construction of Light Weight Structures, as a revolution in the existing construction industry.

VI. REFERENCES:

1]. A.V.S.Sai. Kumar, Krishna Rao (2014), *" Study on Strength of Concrete With Partial Replacement Of Cement With Quarry Dust And Metakaolin",* International Journal of Innovative Research in Science, Engineering and Technology Vol. 3, Issue 3, March 2014.

2]. Amarnath Yerramala, (2014), *"Properties of concrete with eggshell powder as cement replacement",* The Indian Concrete Journal October 2014

3]. P.S.Kothai, Dr.R.Malathy, (2014), *"Utilization Of Steel Slag In Concrete As A Partial Replacement Material for Fine Aggregates",* International Journal of Innovative Research inScience,Engineering and Technology Vol. 3, Issue 4, April 2014.

4]. Umapathy U , Mala C, Siva K (2014), *" Assessment of Concrete Strength Using Partial Replacement of Coarse Aggregate for Waste Tiles and Cement for Rice Husk Ash in Concrete",* Int. Journal of Engineering Research and Applications, ISSN : 2248-9622, Vol. 4, Issue 5(Version 1), May 2014, pp.72-76.

5]. A.M. Mustafa Al Bakri, M.N. Norazian, H. Kamarudin1, M.A.A. Mohd Salleh, and A. Alida (2013), *"Strength of Concrete Based Cement Using Recycle Ceramic Waste as Aggregate",* Advanced Materials Research Vol. 740 (2013) pp 734-738 © (2013) Trans Tech Publications, Switzerland doi:10.4028/www.scientific.net/AMR.740.734

6]. Amitkumar D. Raval, Dr.Indrajit N. Patel, Prof. Jayeshkumar Pitroda (2013), *"Ceramic Waste : Effective Replacement Of Cement For Establishing Sustainable Concrete",* International Journal of Engineering Trends and Technology (IJETT) - Volume4 Issue6- June 2013.

7]. Dr. G.Vijayakumar, Ms H. Vishaliny, Dr. D. Govindarajulu (2013), *" Studies on Glass Powder as Partial Replacement of Cement in Concrete Production",* ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 3, Issue 2, February 2013

8]. M. Iqbal Malik, Muzafar Bashir, Sajad Ahmad, Tabish Tariq, Umar Chowdhary (2013), *"Study of Concrete Involving Use of Waste Glass as Partial Replacement of Fine Aggregates",* IOSR Journal of Engineering (IOSRJEN) e-ISSN: 2250-3021, p-ISSN: 2278-8719 Vol. 3, Issue 7 (July. 2013),||V6 || PP 08-13.

9]. Yogendra O Patil, Prof.P.N. Patil, Dr. Arun Kumar Dwived (2013), *"GGBS As Partisal Replacement of OPC Cement Concrete-An Experimental study",* International Journal Of Scientific Reasearch Volume : 2 | Issue : 11 | November 2013 • ISSN No 2277 - 8179

10]. Chandana Sukesh, Bala Krishna Katakam, P Saha and K. Shyam Chamberlin (2012), *"A Study of Sustainable Industrial Waste Materials as Partial Replacement of Cement"*, IPCSIT vol. 28 (2012) © (2012) IACSIT Press, Singapore.