IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Investigation Of Light Weight Concrete Properties With Partial Replacement Of Fine Aggregate By Foundry Sand

[1]G.Srikanth, [2]Mohammad Sameer Uddin
[1]Assistant Professor , [2,]M.E Student
[1]Civil Engineering,
[1]Lords Institute of Engineering & Technology, Hyderabad, Telangana

I.INTRODUCTION

The construction sector is quickly growing, and new methods are being used to enable quicker and more effective work in the field. In this industry, concrete is a key building material, but producing it consumes a lot of natural resources, which can be expensive and unsustainable in the long run. It is crucial to either recover these natural resources or discover different solutions that can lessen the issue in order to handle these difficulties. Currently, waste foundry sand—a by-product of the metal casting industry—is contributing to several environmental issues. However, utilising this trash in the construction of buildings may help to lessen the environmental impact. We can lessen the construction industry's negative environmental effects and advance sustainability by figuring out how to integrate leftover foundry sand into building materials. It is crucial to investigate the possibilities of used foundry sand as a useful substitute material for building construction.

II. OBJECTIVE

1. To lower building costs while maintaining high standards of quality

2. The goal of this project is to address the problem of disposing of foundry waste by identifying alternative remedies

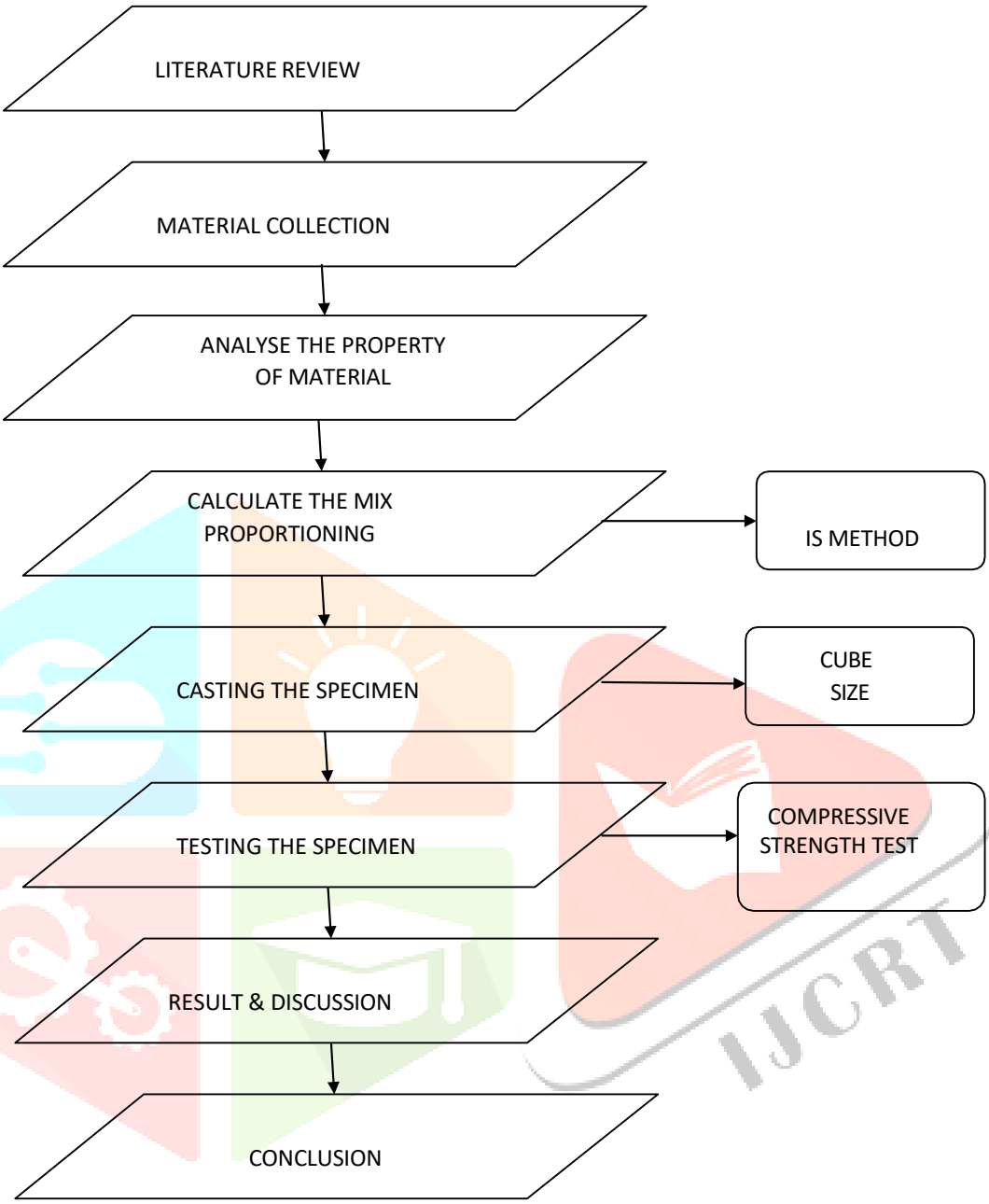
3. The purpose of this study is to show that foundry sand can be used in building instead of fine aggregate.

4. The purpose of this study is to determine the effects of replacing fine aggregate in M25 grade concrete with foundry waste at different ratios (15%,25%, and 35%).

5. This study's goal is to compare the strength of ordinary concrete to the compressive strength of a concrete mix that contains foundry sand.

III. METHODOLOGY

3.1 Flow diagram of methodology



3.2 MIX DESIGN

Concrete Mix Design of M25 by LS code Method (IS 10262-2009):

In order to produce concrete that meets minimum strength and durability criteria while still being as cost-effective as feasible, the mix design process entails selecting the right concrete materials and determining their relative proportions.

1) Making sure that the concrete reaches the required minimum strength and durability is the main goal of mix design.
2) Finding the most economical way to create concrete is the secondary goal.

Design stipulation

1) designation of grade: M25
2) Cement type: OPC 53 grade according to IS8112
3) aggregate nominal size at its maximum: 20 mm
4) smallest amount of cement: 340kg/m3
5) Maximum cement to water ratio:0.43
6) Workability :50 mm
7) Exposure circumstance: Extreme
8) Continuity of supervision: Very Good
9) Crushed angular aggregate is the type of aggregate.
10) highest level of cement: 450kg/m3
11) Chemical admixture type: Super plasticizer

Test data for material:

12) Utilised cement: OPC 53 grade compliant to IS8112
13) Cement's specific gravity is 3.15.
14) Chemical admixture: Super plasticizer
15) A coarse aggregate's specific gravity is 2.89, whereas a fine aggregate's is 2.6.
16) Sieve analysis: Zone III for fine aggregate.

3.3 MIX PPROPORTION

0% of Foundry sand	Cement (kg)	Fine Aggregate (kg)	Foundry Sand (kg)	Coarse Aggregate (kg)	Water (kg)
0	8.5	21	0	16.25	4.25
15	8.5	17.85	3.15	16.25	4.25
25	8.5	15.75	5.25	16.25	4.25
35	8.5	13.65	7.35	16.25	4.25

Table 3.1 : Proportions of concrete material at different percentage

Figure 3.1: Mixing of Concrete

Figure 3.2: cube blocks

Figure 3.3 : removing mould

Figure 3.4: curing concrete cubes

IV. RESULT AND DISCUSSION

4.1 COMPRESSION TEST

A compressive strength test was carried out on a set of 24 cubes with dimensions of 150 x 150 x 150mm. Prior to the testing, workability tests were performed on the cubes. The elastic modulus of the cubes was assessed after 7 days , 14 days, and 28 days after casting. The following table provides a summary of the test results:

4.1 : Show result of compression strength cube test

SI. No	Mix Designation	Aggregate Replacements%	Compressive strength of M25 grade in N/mm^2		
			7th Day	14th Day	28th Day
1	A0	0	17.9	23.8	26.6
2	A1	15%	18.7	22.9	26.1
3	A2	25%	17.1	21.8	24.6
4	A3	35%	16.9	20.7	22.4

Figure 4.1: Compression test of concrete cube

Figure 4.2 : compression test of concrete cubes

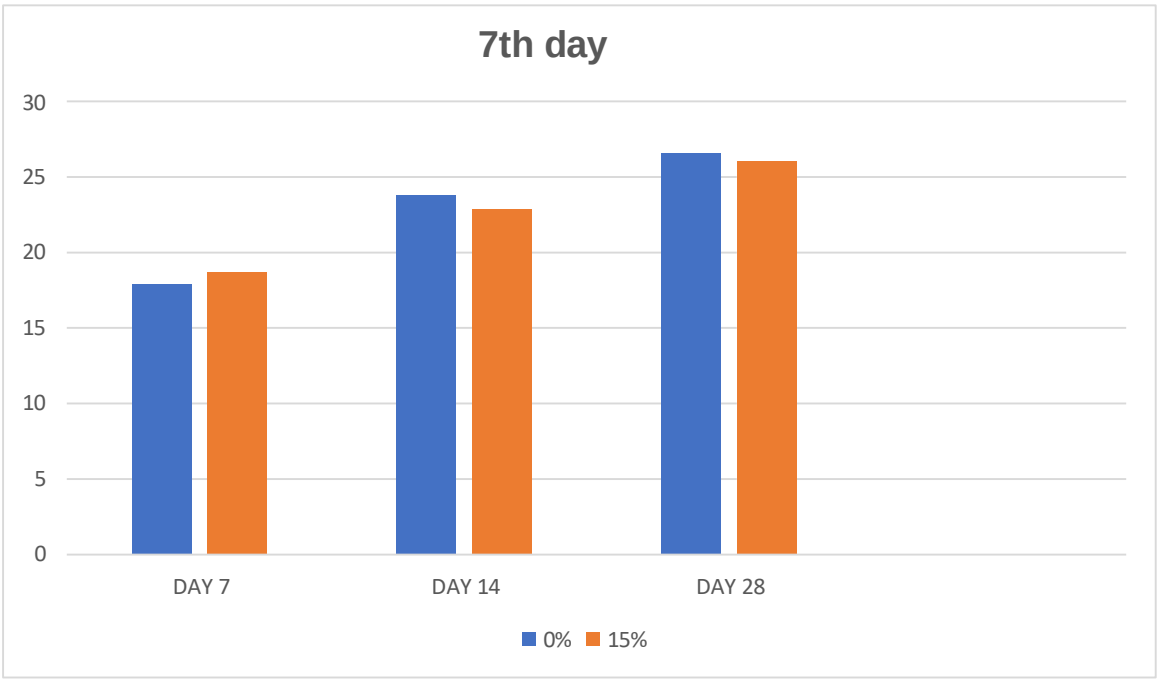


Figure 4.3:Comparison of compressive strength of 7th day

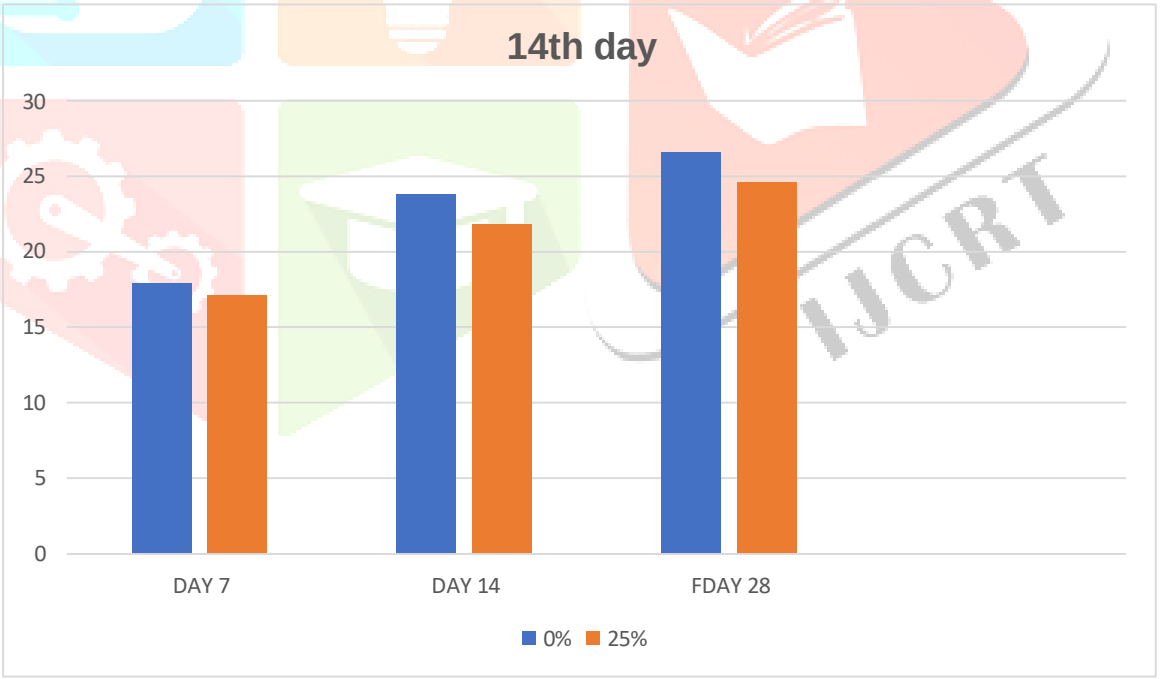


Figure 4.4 :Comparison of compressive strength for 14th day

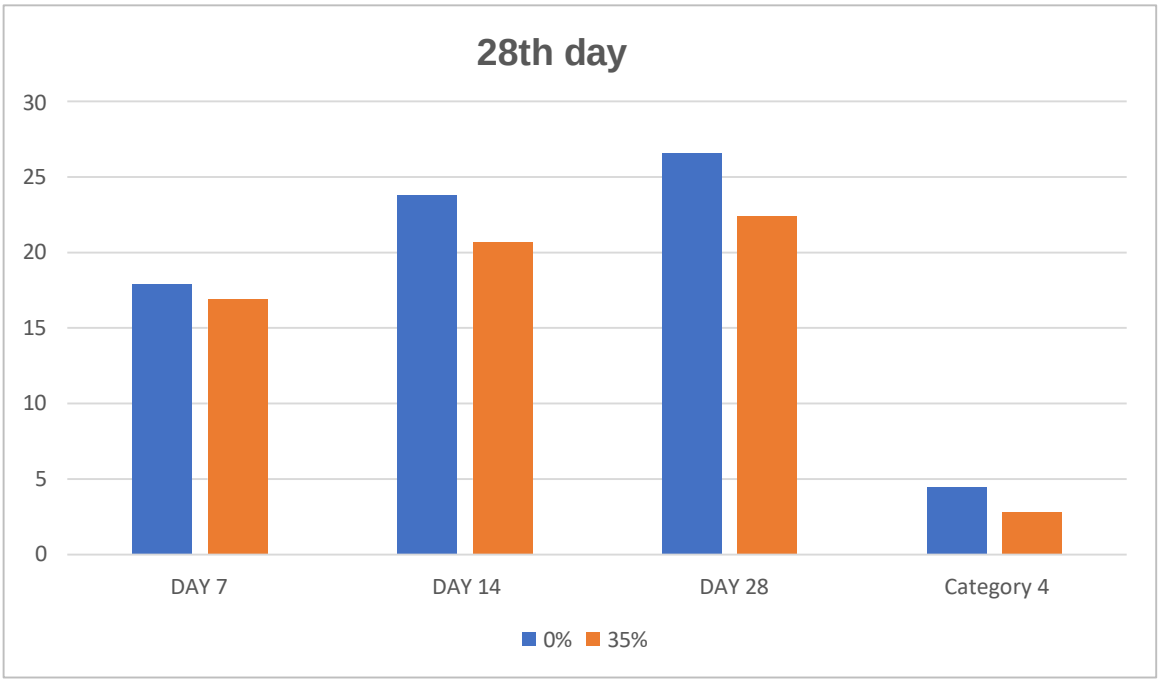


Figure 4.5 : Comparison of compressive strength for 28th day

The test findings show that using Foundry sand aggregates in place of traditional aggregates can result in concrete with qualities similar to those of traditional concrete.

The concrete in mixtures' compressive strength A1, A2, and A3 differed from ordinary concrete (A0) by 4.3%, 4.5, and 5.7%, respectively, after 7 days of curing. After 14 days of curing, the compressive strength of concrete in mixes A1, A2, and A3 differed from ordinary concrete (A0) by 3.8%, 8.7%, and 13.9%, respectivelyThe concrete in mixtures' compressive strength A1, A2, and A3 differed from ordinary concrete (A0) by 1.8%, 7.8%, and 17.1%, respectively, after 28 days of curing.

A1 mix, which substituted 15% of its using foundry sand with fine aggregate aggregates, had the most significant compressive strength of all the mixtures in terms of strength performance.

V. CONCLUSION

- In this project, waste foundry sand will be substituted for fine aggregate at varied ratios ranging from 0% to 60% to produce lightweight concrete. However, there is a problem when used foundry sand is used with concrete.
- To determine the optimal outcomes, an extensive analysis was done. According to the study, when compared to typical concrete's waste composition as a % foundry sand increased with an increase in compressive strength.
- The study discovered that a 40% substitution of fine aggregate with used foundry sand produced the best compressive strength. Concrete is a green building material because it uses discarded foundry sand, which lowers waste generation in the metal industry.
- Additionally, this lowers the expense of maintaining landfills and disposing of waste.

REFERENCES

[1]. Amitkumar D. Raval, Arti Pamnani and AlefiyaI.Kachwala , "Foundry Sand : Utilization as a Partial Replacement of Fine Aggregate for Establishing Sustainable Concrete" ISSN:2277-9655, pp 308-311, January 2015.

]. Shyam Makwana and Prof.Yashwantsinh Zala , "A Review on Utilization of Ceramic Waste and Foundry Sand in Concrete" ISSN-2249-555X,Vol-5,Issue- 1,January2015.

[3]. Dr.B. Kameshwari, Vignesh Kumar M, Vijayan.V, "Strength of Concrete Incorporating Waste Foundry Sand" IJIRS ISSN 2319-9725 Volume-3Issue4, April 2014.

[4].PradeepKumar,Dr.P.Eswaramoorthi,BasilBaby,"Strength Characteristics of Structural Concrete Elements Using Foundry Sand" IJERA ISSN: 2248-9622 . January2014.

[5]. Eknath P.Salokhe, D.B.Desai, "Application of Foundry Waste Sand in Manufacture of Concrete" IOSR-JMCE ISSN:2278-1684.

[6]. Sohail Md , AbdulWahab , ArfathKhan Md, "A Study on the Mechanical Properties of Concrete by Replacing Sand with Waste Foundry Sand"IJETAE ISSN: 2250-2459 Volume-3,Issue-11,November2013.

[7]. Rafat Siddiquea, Ravinder Kaur Sandhu, "Properties of Self Compacting Concrete Incorporating Waste Foundry Sand" LJS ISSN:1583-0233,Issue-23,December2013.

[8].IS:10262-1982 "Recommended guide lines for concrete mix design" Bureau of Indian Standards, New Delhi , India.

[9].IS:10262-2009 "Recommended Guidelines For Concrete Mix Design" Bureau of Indian Standards, New Delhi, India.

[10].IS:1199-1959 "Indian standard methods of sampling and analysis of concrete" Bureau of Indian Standards,NewDelhi,India.

[11].IS:516-1959 "Indian standard code of practice- methods of test for strength of concrete" Bureau of Indian Standards, New Delhi, India.

[12].IS:456-2000 "Code of Practice for Plain and Reinforced Concrete" Bureau of Indian Standards, New Delhi, India.

[13]. Batayneh M., Marie I., Asi I., (2006), Use of selected waste materials in concrete mixes, Waste management, 27, pp 1870–1876.

[14]. Soroushian P., Mirza F., Alhozaimy A., (1995), Permeability characteristics of polypropylene fiber reinforced concrete, ACI materials journal, 92 (3), pp 291–295.

[15]. Ismail ZZ, Al-Hashmi EA, (2008), Use of waste plastic in concrete mixture as aggregate replacement,Waste Managemnet, 28(11), pp 2041-2047.

[16]. Al-Manaseer A.A., T.R., Dalal, (1997), Concrete containing plastic aggregates, Concrete International, 19(8), pp 47– 52.

[17]. Choi Y.W., Moon D.J., Chung J.S., Cho, S.K., (2005), Effects of waste PET bottles aggregate on properties of concrete. Cement and concrete research, 35, pp 776–781.

[18]. Marzouk O. Y., Dheilly R.M., Queneudec M., (2007), Valorization of post- consumer waste plastic in cementitious concrete composites, Waste management, 27, pp 310–318.

[19]. T. Ochi S. Okubo K. Fukui., (2007), Development of recycled PET fiber and its application as concrete-reinforcing fiber, Cement and Concrete Composites, 29, pp 448-455.

[20]. Sung Bae Kim, Na Hyun Young Kim, Jang-Ho Jay Kim, Young-Chul Song., (2010), Material and structural performance evaluation of recycled PET fiber reinforced concrete, Cement and concrete composites, 32, pp 232-240.

[21]. Dora Foti., (2011), Preliminary analysis of concrete reinforced with waste bottles PET fibers, Construction and building materials, 25, pp 1906-1915.

[22]. R. N. Nibudey, P. B. Nagarnaik, D. K. Parbat, A. M. Pande., (2013), Strength and fracture properties of post consumed waste plastic fiber reinforced concrete, International journal of civil, structural, environmental and infrastructure engineering research and development, 3(2), pp 9-16.