

Experimental Concrete Brick Adding Glass, Plastic and Foundry Sand

Musrifath M¹, AnfaAnjuK², Nijil GafasPV³, Kunhassan KM⁴, Silia Mary Silbi⁵Fathima Fayiza Elachola⁶

U.G Student, Department of Civil Engineering, Eranad knowledge City Technical Campus, Manjeri, Malappuram, Kerala, India¹Orcid Id: 0009-0009-7156-7681

U.G Student, Department of Civil Engineering, Eranad knowledge City Technical Campus, Manjeri, Malappuram, Kerala, India²Orcid Id: 0009-0007-7999-6523

U.G Student, Department of Civil Engineering, Eranad knowledge City Technical Campus, Manjeri, Malappuram, Kerala, India³Orcid Id: 0009-0007-8222-1550

U.G Student, Department of Civil Engineering, Eranad knowledge City Technical Campus, Manjeri, Malappuram, Kerala, India⁴Orcid Id: 0009-0000-9438-9851

Assistant Professor, Department of Civil Engineering, Eranad knowledge City Technical Campus, Manjeri, Malappuram, Kerala, India⁵Orcid Id: 0009-0003-4775-2920

Assistant Professor, Department of Civil Engineering, Eranad Knowledge City Technical Campus, Manjeri, Malappuram, Kerala, India⁵ Orcid Id: 0009-0008-3614-6817

ABSTRACT: Plastics and glass generated in large amount with increase in population. Disposal of waste materials including waste plastic and glass has become a serious problem. The waste plastics and glass in house hold is large and increases with time. Waste of high density polyethylene type plastic used in this project and glass powder of 150micron size is used. In the manufacturing of this concrete bricks, plastics were crushed and added up to 15% and glass added 20%. We can also add foundry sand. Foundry sand can be used in concrete to improve its strength and other durability factors which is also eco friendly. Use of foundry sand can save the ferrous and non-ferrous metal industries disposal. The main aim of the project is to utilize those plastics, glass and foundry sand. These bricks are undergo compressive strength test and water absorption test. It will be definitely cost economical when compared with the normal concrete bricks.

KEYWORDS: Concrete, Plastic, Glass powder, Foundry sand.

I. INTRODUCTION

Plastics and glasses are very common material that is now widely used by everybody in world. The great problem with plastic and glasses are its disposal. Plastics were made of polymer chemicals and they were not bio degradable. Which means that plastic will not decompose when it is buried? Though plastics has a very useful materials that is flexible, tough and rigid they become waste after their use and they pollute the atmosphere. Recycling is the process that used materials (waste) into new products to prevent waste of potentially useful materials. Increase in the popularity of using environmental friendly, low cost and lightweight construction materials in the building industry has brought about the need to investigate how this can be achieved by benefiting to the environment as well as maintaining the material requirements affirmed in the standards. To protect the environment as well as to take the advantage of plastics and glasses recycling procedure where used. In this study, plastic, glass and foundry sand will be used to incorporate concrete with to produce concrete bricks. The bricks will then be tested to study compressive strength and water absorption test as per IS 2185 part 2.

Waste generated from the industries cause environmental problems. Hence reuse of this Waste material can be emphasized. Foundry sand were high quality silica sand that was by-product from the production of both ferrous and non-ferrous metal casting Industries. Foundry sand used for centuries as moulding casting material because it has a

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high thermal conductivity. The physical and chemical characteristics of foundry sand will depend in the great part on the type of casting process and the industry sector from which it originate. In casting process, moulding sands are recycled and reused multiple times. Eventually, however, recycled sand degrades to point that it can no longer be reused in casting process. In addition to the greenhouse gases, Reduction in the waste plastics and waste glass can reduce a range of pollutants from entering the air and water. Our waste reduction and the use of waste material in precast blocks can make a difference.

II. RELATED WORK

Glass is an amorphous material with high silica content making it potentially pozzolanic when particle size is less than 90µm. The main problem while using crushed glass as aggregate in Portland cement concrete are expansion and cracking Caused by the glass aggregate due to alkali silica reaction. Due to silica content, ground glass is considered as a pozzolanic material and as such can exhibit properties similar to other pozzolanic materials. In this study, the finely powdered waste glasses are used as the partial replacement of cement in the concrete and compared it with the conventional concrete.

Plastics are commonly used as substances which play an important role in almost every aspect of our lives. The widespread generation of plastics waste needs proper end-of-life management.

Moulding sand, also known as foundry sand, a sand that when moistened and compressed or oiled or heated tends to pack well and to hold its shape. It is used in process of the sand casting for preparing the mould cavity. The Foundry sand consists primarily of clean, uniformly sized, high quality silica sand or larks and that is bonded to form moulds for ferrous (iron and steel) and nonferrous (copper, aluminum, brass) metal castings.

III. METHODOLOGY

The main research of the project is to permanent use of plastic was as partial replacement of the coarse aggregate foundry sand as partial replacement of fine aggregate and glass powder as partial replacement of cement to the production of concrete. It is fundamental to know the substitution of these materials is satisfied. The collection of plastic waste from house and industrial plastic waste at Manjeri. The collected plastic was then crushed into 10-15mm size by crusher manual method. Preliminary tests such as Water absorption, sieve analysis and specific gravity were conducted to check whether it is suitable for the mix. Waste glass powder was collected from a glass cutting factory at Thiruvalli. The collected glass powder is sieved through 90micron sieve to remove large sized glass particles. Initial and final setting time, fineness test, specific gravity and consistency tests were performed to matching with the properties of cement. Foundry sand was collected from Coimbatore. Sieve analysis and specific gravity tests were performed to matching with the properties of sand. To mix these materials 1:1.5:3 is selected and mould size of 13x7x5 inches. Some bricks are made by replacing coarse aggregate by 5%, 10%, 15% and 20% with plastic [5]. Some bricks are made by replacing cement by 8%, 10%, 12%, 14%, 16% and 18% with glass powder [4]. Some bricks made by replacing sand by 5%, 10%, 15%, 20%, 25% and 35% with foundry sand [3]. After 21 days of curing, as per IS 2185 PART 2 bricks retested. Compressive strength test and water absorption tests are carried as per IS 2185 PART 2. From these test results, we selected the adopted proportion for the final brick. Final experimental brick is made and completed the tests.

III. EXPERIMENTAL RESULTS

Figures shows the different preliminary tests of the materials and final tests of concrete brick.



(a)

(b)

(c)

(d)

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Fig.1 showing the preliminary tests on the glass powder (a) Specific Gravity test (b) Fineness Test (c) Initial Setting time (d) Final Setting Time

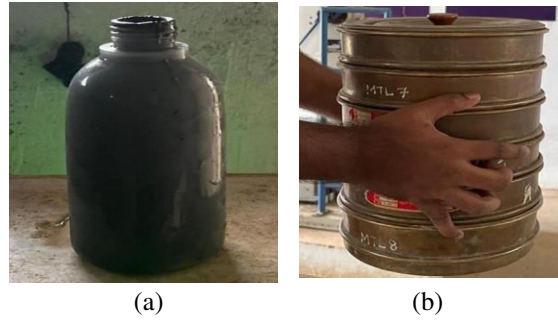


Fig.2 showing the preliminary tests on the foundry sand (a) Specific Gravity test (b) Sieve analysis



Fig.3 showing the preliminary tests on the crushed plastic (a) Sieve analysis Water absorption test



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(d) (e) (f) (g)

Fig. 4 showing making of final brick ; (a) Batching of materials (b) placing of materials to mix machine (c) Mixing (d) placing of mix in to the mould (e) Compacting (f) prepared brick (g) Curing



Fig.5 showing the tests of the brick (a) Compression Strength Test (b) Waterabsorption Test

Table 1 and 2 shows the preliminary test results of glass powder

SLNO.	TESTS	CEMENT	GLASSPOWDER
1	Specific Gravity	3.15g/cm ³	2.38g/cm ³
2	Fineness Test	1.9g	18g

Table 1 specific gravity and fineness test of glass powder

% of glass added to cement	0%	5%	10%	15%	20%
Initial setting time of glass	30min	53min	59 min	1hour9min	1hour 20min
Final setting time of glass	5hour22min	5hour45min	5hour 48min	6hour 25min	7hour 21min

Table 2 Setting time of cement on adding 5%, 10%, 15% and 20%

Table 3 and 4 shows preliminary tests results of foundry sand and plastic respectively

SLNO.	TESTS	FINEAGGREGATE	FOUNDRYSAND
1	Specific Gravity	2.68g/cm ³	2.36g/cm ³
2	Sieve Analysis	2.39	2.602

Table 3 shows preliminary test results of foundry sand



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SLNO.	TESTS	COARSEAGGREGATE	PLASTIC
1	Sieve Analysis	6.49	1.652
2	Water Absorption	0.32%	10.64%
3	Specific Gravity	2.89	1.34

Table 4 shows preliminary test results of plastic Table 5 shows the results of final brick

SLNO.	TESTS	RESULT
1	Compressive Strength Test	23MPa
2	Water absorption Test	2.5%

Table 5 shows the results of compressive strength test and water absorption test.

The project is mainly focused on utilization of waste glass powder, plastic and foundry sand.

III. CONCLUSION

We have collected the materials for the project and we have completed preliminary tests of these materials. Preliminary tests of foundry sand approximately equivalent to the value of the fine aggregate being replaced. Water absorption of plastic is higher than coarse aggregate. Fineness and specific gravity of glass powder approximately equivalent to the value of cement. Glass powder takes more time to settle than cement, that is the initial and final setting time of glass powder is more. After the preliminary test we made brick by replacing in different proportion sand done the compressive strength test and waterabsorptiontest. From that, we concluded by replacing 10% of coarseaggregate with plastic doesn't gives huge difference in the strength and the brick is weightless. By replacing 10% of cement with glass powder also doesn't gives huge differences since, glass powder has silica property of cement. Andby replacing 15% of fine aggregate by foundry sand gives more strength than M-sand or river sand. Hence finally made a final brick by mixing these proportions and Compressive strength and water absorption tests are carried. The test results are satisfied.

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