

STRENGTH STUDIES ON COIR FIBRE CONCRETE BY PARTIAL REPLACEMENT OF CEMENT WITH ALCCOFINE 1203

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Abstract: The most versatile, reliable, and long-lasting building material in the world, concrete serves as the foundation for all civil engineering constructions. Cement, fine and coarse aggregates, and water are the components of concrete, and they are combined in a certain ratio to provide the desired strength. Global cement demand is rising, and there is a strong desire to develop cement substitutes for concrete. The introduction of new alternatives reduces CO₂, a significant gas responsible for the greenhouse effect. Around the world, scientists are conducting research to find new materials. To meet the needs of population increase, river sand is extracted from riverbeds and used to construct homes and massive infrastructure. The advancement of technology and globalization necessary to meet the expectations of the preservation of river sand, which is utilized as a fine aggregate in the production of concrete, has become significantly impacted by the global economy, both domestically and internationally. In this study, a mall trial is conducted to adjust the qualities of concrete by partially replacing cement with alccofine 1203 at different percentages of 0%, 5%, 10.1%, 15.1%, and 20.1% and fine aggregate with coir fibres of length 15mm at various percentages of 0%, 1.1%, 2.1%, 3.1%, and 4.1%. To determine the concrete's compressive and split tensile strengths, various tests are conducted. Compressive and split tensile strength tests are performed on all specimens after 7 and 28 days of use.

Index Terms: Alccofine 1203, Coir fibres, compressive and split tensile strength

I. INTRODUCTION

Solid structure segments in various sizes and shapes incorporate divider boards, door sills, bar, columns and that's only the tip of the iceberg. Post-tensioned chunks are a preferred technique for mechanical, business and private floor piece development. It bodes well to characterize the utilization of cement based on where and how it is created, along with its technique for application since these have diverse necessity and properties. Alccofine-1203 is an eco-friendly and low calcium silicate-based microfine material that consists of a high amount of glass content with high reactivity. Its incorporation in concrete has resulted in good workability, reduction in segregation, reduction in heat of hydration, and reduction in permeability to concrete, and increased the rate of hydration process and improved the pozzolanic reaction to achieve high strength to concrete at the early curing stage. coir fiber is financial, found in overflow and having higher strength and modulus than plastic. As step by step our current circumstance got dirtied, the need of supplanting engineered filaments with the regular fiber for composite creation expanding. coir fiber built up polymer composites are reasonable for the essential primary applications, indoor components in lodging, transitory open-air applications. Minimal expense lodging for restoration and transportation are the best model. The protecting qualities of jute make it valuable in auto entryway, roof boards and board isolating the motor and traveler compartments. Researched the impacts of cycle boundaries, for example, fiber size, fiber condition and with % on elasticity of jute fiber supported thermoplastic composites.

II. OBJECTIVES

The objectives of this study are as follows

- I. To optimize the usage with addition of coir fibre in concrete.
- II. To optimize the usage of Cement with Alccofine (1203)
- III. To evaluate the compressive and spilt tensile strength of concrete.

III. MATERIALS

The properties of cement are presented in Table 1.

Table 1 Physical properties of cement

S. No.	Property	Cement (53 grade)
1	Specific gravity	3.14
2	Fineness	9.85%

3.1 Alccofine 1203: -

Alccofine 1203 is an anhydrous carbonate mineral composed of calcium magnesium carbonate, ideally CAMg (CO₃)₂. The term is also used for a sedimentary carbonate rock composed mostly of the mineral dolomite. The mineral dolomite crystallizes in the trigonal-rhombohedral system. It forms white, tan, grey, or pink crystals. Alccofine 1203 is a double carbonate, having an alternating structural arrangement of calcium and magnesium ions. Unless it is in fine powder form, it does not rapidly dissolve.

3.2 Coir Fibres: -

Coir is a long, delicate, glossy vegetable fibre that can be spun into coarse, solid strings. It is created fundamentally from plants in the sort corchorus, which was once arranged with the family tiliaceae, and all the more as of late with malvaceous the essential wellspring of the fibre is Corchorus olitorius, yet it is viewed as mediocre compared to Corchorus capsularis "jute" is the name of the plant or fibre used to make burlap, hessian or gunny fabric. Coir fibre is composed primarily of the plant materials cellulose and lignin. It falls into the bast fibre category (fibre collected from bast, the phloem of the plant, sometimes called the "skin") along with kenaf, industrial hemp, flax (linen), ramie, etc. The fibres are off-white to brown, and 1–4 meters (3–13 feet) long.

III. EXPERIMENTAL INVESTIGATIONS

4.1 Compressive strength results

The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 2 to 4.

Table 2: Compressive strength of concrete with alccofine 1203 as partial replacement of cement in concrete.

Sl.no	Alccofine (1203)	28 days N/mm ²	56days N/mm ²	90 days N/mm ²
1	0%	40.12	43.71	46.89
2	5.1%	47.29	51.25	55.07
3	10.1%	49.87	54.13	58.18
4	15.1%	58.45	63.69	68.35
5	20.1%	54.88	59.79	63.95

Table 3: Compressive strength of concrete with addition of coir fibres

Sl.no	Coir fibres	28 days N/mm ²	56days N/mm ²	90 days N/mm ²
1	0%	40.12	43.71	46.89
2	1.1%	40.99	44.41	47.74
3	2.1%	41.72	45.45	48.72
4	3.1%	43.33	47.28	50.78
5	4.1%	42.59	46.27	49.73

Table 4: Compressive strength of concrete with Alccofine (1203)&Coir Fibres

Sl.no	AF+CF	28 days N/mm ²	56days N/mm ²	90 days N/mm ²
1	0%	40.12	43.71	46.89
2	15.1%AF+3.1%CF	60.02	65.45	70.25

4.2 Split Tensile strength results

At the age of 7 and 28days, the cylindrical specimens (150mm diameter x 300mm height) were tested for evaluating the split tensile strength. The experiment is performed by putting a cylindrical sample horizontally between a compression testing machine loading surface and the load is applied until the cylinder fails along the vertical diameter.

Table 5: Split Tensile strength of concrete with Alccofine 1203 as partial replacement of cement in concrete

Sl.no	Alccofine(1203)	28days N/mm ²	56days(N/mm ²)	90days(N/mm ²)
1	0%	3.89	4.23	4.54
2	5.1%	4.62	5.02	5.37
3	10.1%	4.93	5.35	5.74
4	15.1%	6.25	6.80	7.31
5	20.1%	5.26	5.73	6.12

Table 6: Split Tensile strength of concrete with Alccofine 1203 as partial replacement of cement in concrete

Sl.no	Coir fibres	28 days N/mm ²	56days N/mm ²	90 days N/mm ²
1	0%	40.12	43.71	46.89
2	1.1%	40.99	44.41	47.74
3	2.1%	41.72	45.45	48.72
4	3.1%	43.33	47.28	50.78
5	4.1%	42.59	46.27	49.73

IV. CONCLUSION

In this study, the concrete ingredients like cement and fine aggregate are partially replaced by Alccofine 1203 and Coir fibres respectively. Coir fibres are of 15cm with different percentages like 0%,1.1%,2.1%,3.1%,4.1% and Alccofine 1203 is varied with different percentages like 0%,5.1%, 10.1%,15.1%,20.1%.

- At 15.1% replacement of cement by alccofine the achieved compressive strength of concrete is 58.45 N/mm² for 28 days, 63.69 N/mm² for 56 days and 68.35 N/mm² for 90 days.
- At 3.1% addition of coir fibres in concrete the achieved compressive strength of concrete is 43.33 N/mm² for 28 days, 47.28 N/mm² for 56 days and 50.78 N/mm² for 90 days.
- At 15.1% replacement of cement by alccofine the achieved split tensile strength of concrete is 6.25 N/mm² for 28 days, 6.80 N/mm² for 56 days and 7.31 N/mm² for 90 days.
- At 3.1% addition of coir fibres in concrete the achieved split tensile strength of concrete is 4.67 N/mm² for 28 days, 5.09 N/mm² for 56 days and 5.47 N/mm² for 90 days.
- At combined replacement of alccofine and coir fibres of 0% the achieved compression strength of concrete is 60.02 N/mm² for 28 days, 65.45 N/mm² for 56 days and 70.25 N/mm² for 90 days.
- At combined replacement of alccofine and coir fibres of 0% the achieved compression strength of concrete is 6.63 N/mm² for 28 days, 7.23 N/mm² for 56 days and 7.77 N/mm² for 90 days.

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