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Behaviour of Concrete by the Partial Replacement of Fine Aggregate with Sawdust and Cement with Alccofine1203

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Abstract: *This research looks at using saw dust as a waste material to replace sand and Alccofine (1203) as a partial replacement for cement in concrete to change its qualities. Sand was substituted by weight in the concrete mixes, and the effects of the change on the concrete were examined. The use of saw dust in concrete allows waste (saw dust) to be disposed of while also making concrete lighter in weight. Alccofine (1203) is added as admixture to partial replacement of cement with different percentages of 0%,4%,8%,12%,16% &20% and sawdust is added as admixture to partial replacement of fine aggregate with different percentages of 3%,6%,9%& 12%.The test results were obtained with reference to compressive and split tensile strength at 7 &28 days.*

Keywords: Alccofine (1203), Sawdust, compressive strength, split tensile

I. INTRODUCTION

Concrete is a composite material composed of coarse aggregate bonded together with a fluid cement which hardens over time. Most concretes used are lime-based concretes such as Portland cement concrete or concretes made with other hydraulic cements. For high strength, Alccofine is a new generation micro fine concrete material and which is important in respect of workability as well as strength. Also, Alccofine is easy to use and it can be added directly with cement. The ultrafine particle of Alccofine provides better and smooth surface finish. Alccofine has unique characteristics to enhance 'performance of concrete' in fresh and hardened stages due to its optimized particle size distribution Sawdust is not a familiar material in the construction/building industry. This is either because it is not available in very large quantities as sand or gravel, or because their use for such has not been encouraged. For some time now, there have been calls for the use of local materials in the construction industries especially in developing countries to check costs of construction. Sawdust can be defined as loose particles or wood chippings obtained as by-products from sawing of timber into standard useable pieces.

II. OBJECTIVES

The objectives of this study are as follows

1. To optimize the usage of cement with Alccofine (1203) in concrete.
2. To optimize the usage of fine aggregate with Sawdust
3. To evaluate the compressive and spilt tensile strength of concrete.

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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	9.75%

3.1 Alccofine (1203)

The Alccofine is manufactured by Ambuja Cements Ltd was used in this experiment as a mineral admixture. The products alccofine 1203 is a supplementary cementitious material suitably replaces silica fume used in high performance concrete. It is obtained from the materials of the iron ore industry. The chemical composition of the alccofine shows higher percentage of the alumina content and silica content. ALCCOFINE1203provides reduced water demand for a given workability, even up to 70% replacement level as per requirement of concrete performance.

3.2 Saw Dust

Sawdust is a by-product or waste product of woodworking operations such as sawing, milling, planning, routing, drilling and sanding. It is composed of fine particles of wood. These operations can be performed by woodworking machinery, portable power tools or by use of hand tools. Sawdust's are produced as a small discontinuous chips or small fragments of wood during sawing of logs of timber into different sizes.

IV. 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 withAlccofine (1203)

Sl.no	Alccofine	7 days	28 days
1	0%	27.12	39.15
2	4%	31.76	46.44
3	8%	35.15	50.29
4	12%	36.18	53.37
5	16%	40.29	56.70
6	20%	37.17	53.80

Table 3: Compressive strength of concrete with Sawdust

Sl.no	Sawdust	7 days	28 days
1	3%	27.12	39.15
2	6%	21.47	30.83
3	9%	17.62	25.66
4	12%	13.04	19.88

Table 4: Compressive strength of concrete with Alccofine(1203)and Sawdust

Sl.no	AF+SD	7 days	28 days
1	0%	27.12	39.15
2	16%AF+6%SD	37.15	52.55

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4.2 Split Tensile Strength Results

The split tensile strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 5 to 7.

Table 5: Split tensile strength of concrete with Alccofine (1203)

Sl.no	Alccofine	7 days	28 days
1	0%	2.50	3.59
2	4%	3.12	4.59
3	8%	3.37	4.87
4	12%	3.67	5.25
5	16%	4.29	6.12
6	20%	3.56	5.19

Table 6: Split tensile strength of concrete with sawdust

Sl.no	Sawdust	7 days	28 days
1	3%	2.50	3.59
2	6%	2.12	3.04
3	9%	1.73	2.49
4	12%	1.17	1.78

Table 7: Split tensile strength of concrete with Alccofine &Sawdust

Sl.no	AF+SD	7 days	28 days
1	0%	2.50	3.59
2	16%AF+6%SD	2.64	3.78

V. CONCLUSION

[1]. At 16% partial replacement of Alccofine (1203) with cement the compressive strength of concrete at 7 and 28 days are 40.29 and 56.70N/mm2.

[2]. 2.At 16% partial replacement of Alccofine with cement the split tensile strength of concrete at 7 and 28 days are 4.29and 6.12 N/mm2.

[3]. At 6% partial replacement of sawdust with fine aggregate the compressive strength of concrete at 7 and 28 days are 21.47 and 30.83 N/mm2.

[4]. At 6% partial replacement of sawdust with fine aggregate the split tensile strength of concrete at 7 and 28 days are 2.12 and 3.04 N/mm2.

[5]. By the combination of 16% Alccofine +6% sawdust with cement and fine aggregate the compressive strength of concrete at 7 and 28 days are 37.15 and52.55N/mm2.

[6]. By the combination of 16% Alccofine +6% sawdust with cement and fine aggregate the split tensile strength of concrete at 7 and 28 days are 2.64 and 3.78N/mm2.

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