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PARTIAL REPLACEMENT OF CEMENT, SAND & AGGREGATE WITH WASTE AVAILED FROM CONSTRUCTIONAL DETERIORATION WORK

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***Abstract*- This study examines the feasibility of using R&D waste as a substitute component in composites. Many historic buildings were demolished to repair damage and cracks, and these ruins were called waste. When new buildings are built, construction waste is generated. In terms of total construction and construction waste, approximately 25% of solid waste is generated annually by existing buildings and 75% by the construction of new buildings. Glass waste from constructional and deterioration disposal was used in this project because it has pozzolanic properties similar to cement. Therefore, it is replaced by concrete. Glass waste collected from food scraps is crushed into a fine powder similar to concrete crumbs. Industrial waste such as industrial sand, recycled waste, silica dust, broken glass and sawdust are common in urban areas. However, very little of the waste is recycled or reused. On the one hand, strict environmental laws and the lack of waste in cities make it more difficult to dispose of industrial waste, even if the production of goods is complex. This paper presents the results of field trials conducted to evaluate the effectiveness of sawdust as a substitute for concrete and the effectiveness of fine and dense aggregates in formwork design. The concrete components are then gradually replaced with part of the crushed waste. Compressive strength was tested at ages 7 and 28 days.**

***Keywords*- Cement, Waste Material, Sand, Concrete, Compressive Strength, Silica, Dust, Broken Glass, Constructional.**

I. INTRODUCTION

The solid waste problem is one of the most serious environmental and social challenges in any country. In this city, solid waste and waste of cement and other materials are not properly recycled and are dumped in landfills. In addition, rapid building development quickly destroys natural resources, especially when beach sand is used as a fine and tough aggregate [1]. Therefore, using constructional and deterioration waste as a recycling material for conventional computers is a good option for this situation [6]. In this study, only sawdust made from building materials and sawdust was used to replace the accessible parts. The feasibility of employing construction and demolition waste materials in concrete composites as a partial substitute for raw materials is investigated in this study. Numerous historic buildings are being demolished to address deterioration and cracks, and the debris generated from these buildings called demolition waste. Construction trash is generated during the construction of new buildings about 25% of solid waste is generated annually by existing buildings and 75% by new construction projects. Small pieces of crushed material commonly used in applications such as flooring systems, packaging, light parts and kitchen cabinets are reduced to dust and replaced with fine aggregates. Wood chips absorb more water than fine aggregate. The replacement of different types of free goat and natural resources allows you to determine the actual strength of the material after hardening, the mach inability of the finished material and many other physical properties of the material.

II. USED MATERIALS IN MIX OF CONCRETE

- Cement
- Natural Coarse Aggregate (NCA)
- Natural Fine Aggregate (NFA)
- Coarse Glass Pieces (CGP)
- Crush Concrete Powder (CCP)
- Admixture
- Water

III. MIX DESIGN OF PREPARED FOR ANALYSIS

An M-25 grade compactor is used for this job. Replace the cement with 0%, 4%, 8% and 16% cement powder. The totals were replaced by 0%, 4%, 8% and 16% glasses. FA is replaced with 0%, 4%, 8% and 16% sawdust. There are two types of tests: working time and treatment time.

Here, CCP=Crushed Concrete Powder, CGP=Coarse Glass Pieces

Table 1: Mix samples for Testing Cement with CCP

No. of Mix	CCP	Cement
Mix-4	0%	100%
Mix-B	4%	96%
Mix-C	8%	92%
Mix-D	16%	84%

Table 2: Mix samples for Testing Coarse Aggregate with CGP

No. of Mix	CGP	Aggregate
Mix-I	0%	100%
Mix-II	4%	96%
Mix-III	8%	92%
Mix-IV	16%	84%

Table 3: Mix of M30 Concrete 0% substitution of Cement with CCP and Varying % of Aggregate Replacement with Used CGP and Saw Dust

No. of Mix	CCP	CGP	Saw Dust
Standard	0%	0%	0%
Mix-1	0%	4%	4%
Mix-2	0%	8%	8%
Mix-3	0%	16%	16%

Table 4: Mix of M30 Concrete 4% substitution of Cement with CCP and Varying % of Aggregate Replacement with Used CGP and Saw Dust

No. of Mix	CCP	CGP	Saw Dust
Mix-1	4%	0%	0%
Mix-2	4%	4%	4%
Mix-3	4%	8%	8%
Mix-4	4%	16%	16%

Table 5: Mix of M30 Concrete 8% substitution of Cement with CCP and Varying % of Aggregate Replacement with Used CGP and Saw Dust

No. of Mix	CCP	CGP	Saw Dust
Mix-1	8%	0%	0%
Mix-2	8%	4%	4%
Mix-3	8%	8%	8%
Mix-4	8%	16%	16%

Table 6: Mix of M30 Concrete 16% substitution of Cement with CCP and Varying % of Aggregate Replacement with Used CGP and Saw Dust

No. of Mix	CCP	CGP	Saw Dust
Mix-1	16%	0%	0%
Mix-2	16%	4%	4%
Mix-3	16%	8%	8%
Mix-4	16%	16%	16%

IV. RESULT & DISCUSSION

A. Results of Cement Test

Table 7: Consistency Test Due to Varying % of Cement Replaced with Crushed Concrete Power

No. of Mix	CCP	Cement	Consistency %
Mix-A	0%	100%	30.51
Mix-B	4%	96%	32.64
Mix-C	8%	92%	34.02
Mix-D	16%	84%	35.36

Table 8: Initial and Final Setting Time of Cement due to Varying % of Cement Replaced with Crushed Concrete Power (CCP)

No. of Mix	CCP	Cement	IST (min.)	FST (min.)
Mix-4	0%	100%	32	603
Mix-B	4%	96%	31	608
Mix-C	8%	92%	33	612
Mix-D	16%	84%	34	616

B. Results of Aggregate Test

Table 9: Impact, Crushing and Abrasion test due to varying % of Aggregate replaced with Crushed Glass power (CGP)

No. of Mix	CCP	Cement	Impact %	Crushing %	Abrasion %
Mix-I	0%	100%	22.63	28.56	31
Mix-II	4%	96%	27.06	25.48	33
Mix-III	8%	92%	28.94	24.39	34
Mix-IV	16%	84%	30.59	23.32	35

C. Results of Concrete Test

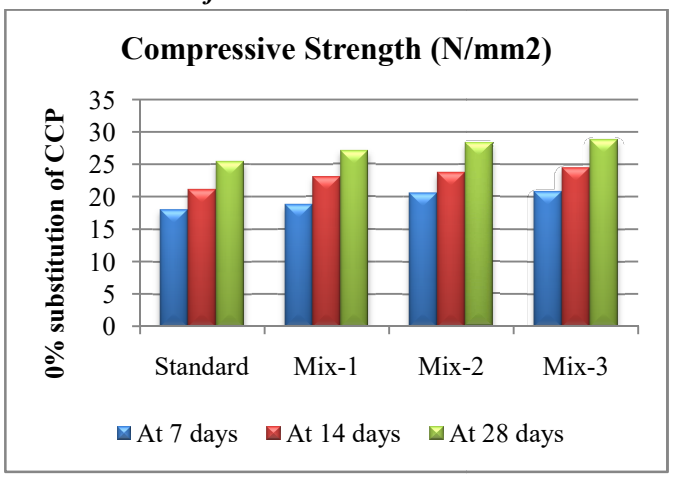

Fig. 1: Concrete Compressive Strength Test at 7, 14 & 28 days Due to 0% Substitution of Cement with CCP and Varying % of Aggregate Replacement with Used CGP and Saw Dust

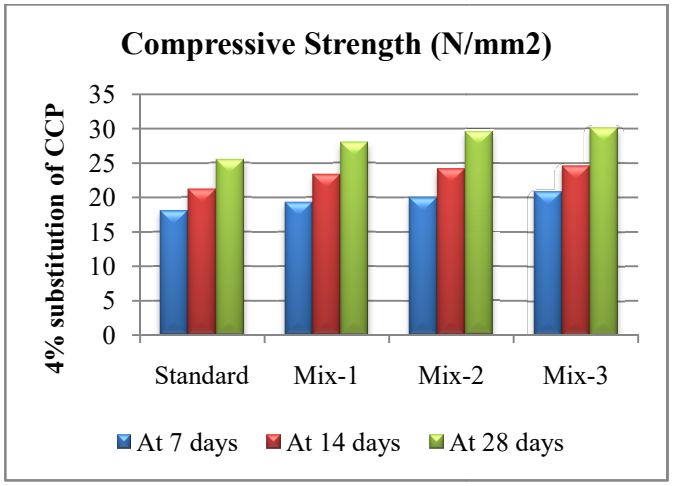

Fig. 2: Concrete Compressive Strength Test at 7, 14 & 28 days Due to 4% Substitution of Cement with CCP and Varying % of Aggregate Replacement with Used CGP and Saw Dust

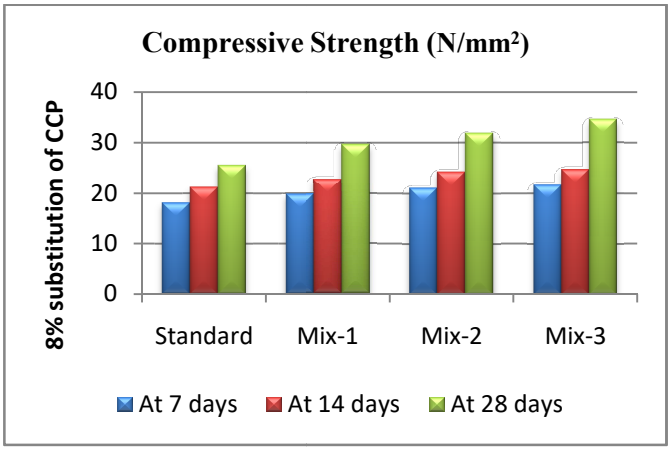

Fig. 3: Concrete Compressive Strength Test at 7, 14 &28 days Due to 8% Substitution of Cement with CCP and Varying % of Aggregate Replacement with Used CGP and Saw Dust

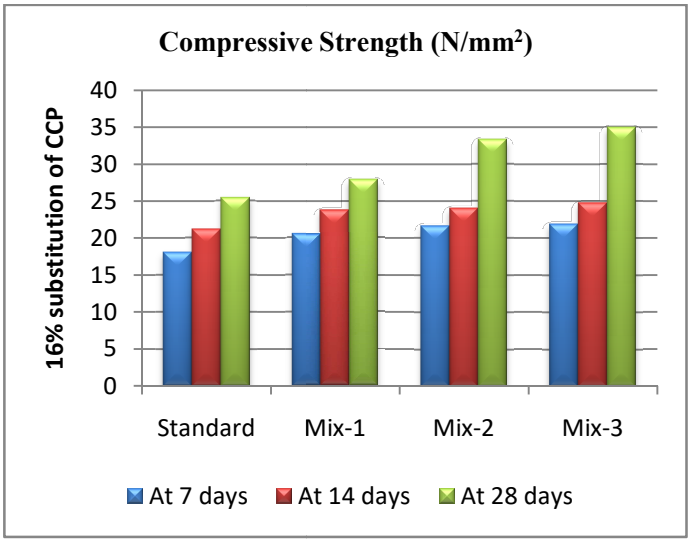

Fig. 3: Concrete Compressive Strength Test at 7, 14 & 28 days Due to 0% Substitution of Cement with CCP and Varying % of Aggregate Replacement with Used CGP and Saw Dust

V. CONCLUSION

- Consistency test value of cement due to varying % of cement replaced with Crushed concrete power (CCP) is 30.51% occurs minimum in (mix–A) but after that as increase as percentage of Crushed concrete power (CCP).
- Initial setting time of cement due to varying % of cement replaced with Crushed concrete power (CCP) is 31(min.) occurs minimum in (mix–B) but after that as increase as percentage of Crushed concrete power (CCP).

- Final setting time of cement due to varying % of cement replaced with Crushed concrete power (CCP) is 603(min.) occurs minimum in (mix–A) but after that as increase as percentage of Crushed concrete power (CCP).
- Impact test value of Aggregate due to varying % of Aggregate replaced with Crushed Glass power (CGP) is 22.63% occurs minimum in (mix–I) but after that as increase as percentage of Crushed Glass power (CGP).
- Crushing test value of Aggregate due to varying % of Aggregate replaced with Crushed Glass power (CGP) is 23.32% occurs minimum in (mix–IV) but after that as decrease as percentage of Crushed Glass power (CGP).
- Abrasion test value of Aggregate due to varying % of Aggregate replaced with Crushed Glass power (CGP) is 31% occurs minimum in (mix–I) but after that as increase as percentage of Crushed Glass power (CGP).
- Maximum value of slump for 0% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust occurs 121mm in mix-1 after addition of Used CGP and saw dust this will reduced to 118mm in mix-3.
- Maximum value of slump for 4% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust occurs 119mm in mix-1 after addition of Used CGP and saw dust this will reduced to 117mm in mix-3.
- Maximum value of slump for 8% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust occurs 118mm in mix-1 after addition of Used CGP and saw dust this will reduced to 115mm in mix-3.
- Maximum value of slump for 16% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust occurs 117mm in mix-1 after addition of Used CGP and saw dust this will reduced to 115mm in mix-3.
- Maximum value of Compressive Strength at 7days for 0% substitution of Cement with CCP and Varying % of aggregate replacement with Used CGP and saw dust compressive strength is 20.88N/mm^2 in mix-3 and minimum compressive strength is occurs 18.80N/mm^2 in mix-1.
- Maximum value of Compressive Strength at 14days for 0% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust compressive strength is 24.53N/mm^2 in mix-3 and minimum compressive strength is occurs 23.06N/mm^2 in mix-1.
- Maximum value of Compressive Strength at 28days for 0% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust compressive strength is 28.86N/mm^2 in mix-3 and minimum compressive strength is occurs 27.07N/mm^2 in mix-1.
- Maximum value of Compressive Strength at 7days for 4% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust compressive strength is 20.87N/mm^2 in mix-3 and minimum compressive strength is occurs 19.26N/mm^2 in mix-1.
- Maximum value of Compressive Strength at 14days for 4% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust compressive strength is 24.63N/mm^2 in mix-3 and minimum compressive strength is 23.31N/mm^2 in mix-1.
- Maximum value of Compressive Strength at 28days for 4% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust compressive strength is 30.12N/mm^2 in mix-3 and minimum compressive strength is 27.94N/mm^2 in mix-1.
- Maximum value of Compressive Strength at 7days for 8% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust compressive strength is 21.62N/mm^2 in mix-3 and minimum

compressive strength is occurs 19.84N/mm^2 in mix-1.

- Maximum value of Compressive Strength at 14days for 8% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust compressive strength is 24.66N/mm^2 in mix-3 and minimum compressive strength is occurs 22.88N/mm^2 in mix-1.
- Maximum value of Compressive Strength at 28days for 8% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust compressive strength is 34.52N/mm^2 in mix-3 and minimum compressive strength is occurs 29.68N/mm^2 in mix-1.
- Maximum value of Compressive Strength at 7days for 16% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust compressive strength is 21.91N/mm^2 in mix-3 and minimum compressive strength is occurs 20.53N/mm^2 in mix-1.
- Maximum value of Compressive Strength at 14days for 16% substitution of Cement with CCP and Varying % of Aggregate replacement with Used CGP and saw dust compressive strength is 24.78N/mm^2 in mix-3 and minimum compressive strength is occurs 23.87N/mm^2 in mix-1.
- Maximum value of Compressive Strength at 28days for 16% substitution of Cement with CCP and Varying % of aggregate replacement with Used CGP and saw dust, compressive strength is compressive strength is occurs 34.97N/mm^2 in mix-3 and minimum compressive strength is occurs 27.91N/mm^2 in mix-1.

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