Mechanical Properties of Concrete, Cement By Waste Paper Sludge Ash Partial Replacement

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Abstract- *The large scale production of cement is causing environmental problems and also depletion of natural resources. This research work demonstrated the possibilities of using waste paper ash as partial replacement of cement in concrete. The compressive strength of concrete were achieved by adding WPSA. Four different replacement levels, namely, 1, 2, 3, and 4% were chosen. The tests result compressive strength increased up to 3% replacement of WPSA. Use of waste paper ash in concrete proved economical.*

I. INTRODUCTION

GENERAL

In order to make concrete industry sustainable, the use of waste materials in place of natural resources is one of the best approaches. Paper mill is a major economic and environmental problem for the paper and board industry. An enormous quantity of waste paper sludge is generated all around the world. In India, 0.7% of total Urban waste generated comprises of paper sludge. UK produces over 1.5 million tons of waste paper sludge annually. Paper mill sludge is a major economic and environmental problem for the paper and board industry.

Waste paper ash by replacement of cement in the range of 0, 1, 2, 3 and 4% which may help to reduce the disposal problem of sludge and enhance the properties of concrete .As waste paper sludge ash contains higher percentage of silicon dioxide SiO_2; it may provide extra strength to concrete. This project will try to study the design parameters of concrete on inclusion of waste paper as partial replacement of cement**.**

SCOPE OF THE STUDY

The review of literature indicates that the paper building brick enhances its various mechanical properties, dimensional stability and structural integrity. The review also indicates that the addition of paper mill residuals, namely waste paper sludge ash give the desirable strength and durability of brick significantly. In most of these studies, the industrial and natural waste like waste paper sludge ash.

OBJECTIVES OF THE STUDY

Utilization of paper waste as additional material in concrete mixes to be used for various construction projects, ensuring that the resulting concrete has proper compressive strength. To prepare mixes containing various proportions of the paper waste.

To develop an eco-friendly concrete with good aesthethic view.

II. LITREATURE REVIEW

Gabriele Fava et.al (2011) On the basis of the data collected, it was concluded the paper mill sludge ash (PA), if used to replace up to 10% of the portland cement, shows a positive effect on the mechanical performance of mortars. On the other hand, because of its high fineness and consequently high water absorption, it required a higher amount of water. It was concluded that the use of PA should not be higher than 10% by weight of the cement replaced, unless mortar mixtures are judiciously proportion.

Dharani N et.al (2013) Hypo sludge was used! as a replacement to cement. Replacement percentages used during the study were 10%, 20%, 30%, 40%, 50%. For each replacement percentage of cement with hypo sludge, 0.2%, 0.3%, 0.4% of Recron 3s fibres were added and specimens were cast to determine the mechanical properties. The optimal replacement percentage of cement with hypo sludge fiber with cement matrix, the compressive strength and split tensile strength decreased with increase in fibre content, however the flexural strength increases with increase in fiber content. When hypo sludge and Recron 3 s fibre added, the optimum dosage of Hypo sludge was 20% and optimum Fiber content was 0.4%.

Bashar S. Mohammed et.al (2015) concluded that higher residual content and fly ash content in the concrete mixtures

would increase the water demand of concrete for a given slump, thus, decreasing the workability of fresh concrete. The workability of concrete containing paper-mill residuals and fly ash content could be adjusted and improved by using proper amount of super plasticizer .The Class F fly ash decreased the workability of concrete due to its high percentage of fly ash replacement in mixtureproportion and high carbon content which increases the water demand.

III. METHODOLOGY AND MATERIALS

CEMENT

1. Consistency - 33%
2. Initial setting time - 30 minutes
3. Final setting time - 10 hours
4. Specific gravity -3.10

FINE AGGREGATE

1. Specific gravity -2.33
2. Fineness modulus -2.85

COARSE AGGREGATE

1. Specific gravity -2.75
2. Fineness modulus -3.15

MIX DESIGN

- The concrete mixes have been prepared as per mix design for M25 concrete
- IS code 10262-2007 can beused

IV. EXPERIMENTAL WORKS

GENERAL

These experiments were conducted on cubes and cylinders are prepared as per the mix design with cement, fine aggregate, coarse aggregate and paper sludge ash.

WORKABILITY FRESH CONCRETE

Workability is defined as the ease with which concrete can be compacted 100% having regard to mode of compaction, flexural test and place of deposition in this project the workability of concrete the slump test and compaction factor test

PREPARATION OF CONCRETE MIX

The concrete mixes have been prepared as per mix design arrived at for M25 concrete. The weight batching was adopted. The measured using various ingredients have been measured using weighting balance and spread in spared in a mixing try mix wet dry mixed was prepared by mixing cement, fine aggregate, coarse aggregate and waste paper sludge ash The water is then added with super plasticizer and mixed twice thoroughly. The mixed is then spread over a wide are in the tray and replaced. Cube moulds of size 150 x 150 x 150 mm were casted. Cylindrical specimens of dimension 150 mm diameter and 300 mm length were cast.

CASTING OF SPECIMENS

The ingredients of concrete as per mix design are weighted. The cement with with concrete mixed thoroughly in the mixing tray and course aggregate are added and mixed twice. The water also added in to the prepared mix and mixed very well. The fresh concrete are taken and filled into slum cone for slump test. The concrete is then filled in the mould of the specimens are compacted by table vibrator and hand. After 24 hours the specimen are remolded and kept immersed in water for curing

CURING OF CONCRETE

Concrete derives its strength by the hydration of cement practices; the hydration of cement is not momentary action but a process continuing for long time. Curing can also be described as keeping the concrete moist and warm enough so that the hydration of cement can continue. The casting of concrete specimens are normally immersed in curing tanks for 28 days duration.

COMPRESSIVE STRENGTH

Cube moulds of size 150 x 150 x 150 mm were casted and allowed for curing in a curing tank for 28 days and these cubes were tested on compression testing machine as per I.S. 516-1959.Cube compressive strength.

(f_{ck}) in MPa = PA Where,

SPLIT TENSILE STRENGTH

Cylindrical specimens of dimension 150 mm diameter and 300 mm length were cast. The specimens were demoulded after 24 hours of casting and were transferred to curing tank for 28 days for curing. The test was conducted as per IS 5816:1999.

Split tensile strength

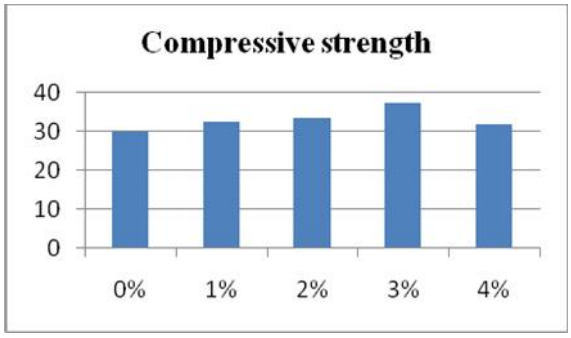
Split tensile strength=2P/πLd

V. RESULTS AND DISCUSSION

COMPRESSIVE STRENGTH RESULT

S.No	% of paper ash	No of curing days	Results (N/mm^2)
1	0%	28days	30.12
2	1%	28days	32.66
3	2%	28days	33.64
4	3%	28days	34.40
5	4%	28days	31.84

Table No.1. Compressive Strength

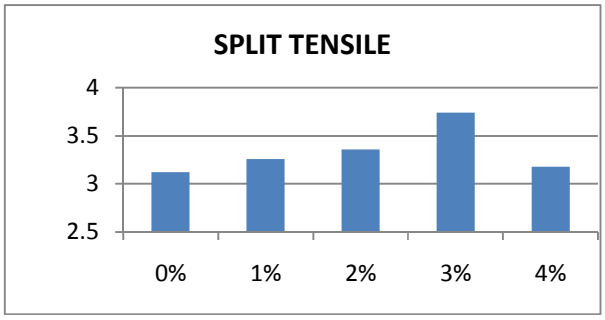


Graph showing Compressive Strength

SPLIT TENSILE STRENGTH RESULT

S.NO	% of paper sludge ash	No .of Curing days	Result (N/mm^2)
1	0%	28days	2.98
2	1%	28days	3.04
3	2%	28days	3.16
4	3%	28days	3.24
5	4%	28days	3.88

Table No.2. Split tensile Strength



Graph showing Split Tensile Strength

VI. CONCLUSION

From the result of compressive strength, split tensile strength the value range should be increases for 3% replacement of cement using paper sludge ash on 28days test compare to conventional concrete. The workability of concrete increased with the increase in paper sludge ash content of cement replacement at same water-cement ratio. The Compressive strength of concrete has increased up to 12.40% by comparing normal Conventional Concrete.The split tensile strength of concrete had increased up to 8.03% by Comparing normal conventional concrete.

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