iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** III **Month of publication:** March 2020

DOI:

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue III Mar 2020- Available at www.ijraset.com

Experimental Study of Textile Concrete with Fly-Ash as using Partial Replacement of Cement

C. Pranesh[1], Deepak. D[2], K. Ranjith Kumar[3], R. Suba Prasath[4],
[1] *Assistant Professor, Department of Civil Engineering, Velalar College of Engineering and Technology*
[2, 3, 4] *UG students, Department of Civil Engineering, Velalar College of Engineering and Technology*

Abstract: Advancement in technology enhance not only human comfort but also damage the environment. Presently the construction industry is in need to finding economical effective materials for improving the strength of concrete. Hence an attempt has been made in the present investigation to study the influence of addition of textile waste materials. In this research work, Textile waste cloth piece- polyester fiber material at a proportion of 0%, 3%, 5%, and 7% by weight of cement will use. Evaluated and comparison of compressive strength, flexural strength and split tensile strength of concrete using M30 mix, water cement ratio 0.45 and test have been carried out as per recommended in relevant codes.
Keywords: Textile waste, Fly-ash

I. INTRODUCTION

The disposal of solid wastes is a major problem throughout the world. Recycling and use of these waste materials, is increasing worldwide, especially in constructions. Using recycled materials and wastes in constructions is becoming more popular due to shortages of natural mineral resources and increasing waste disposal costs. However, with increasing use of wastes in engineering applications, a need for further understanding of their engineering behavior is required.

Textile concrete is a type of reinforced concrete in which the usual steel reinforcing bar replaced by textile material. Textile concrete represents an interesting new construction material, additional advantage compare to steel or fiber reinforced concrete. This material is low weight and high bearing capacity. Uses of textile material are extensively increasing in modern days in combination with materials science and technology.

A. Textile Fiber Classification

It can be defined as spun into a yarn or made into a fabric by various methods including weaving, knitting, braiding, twisting. There are mainly two types: 1) Natural fiber 2) Manmade fiber. Natural fiber included those produced by plants, animals & geological process. They can be classified three groups. (i) Animal fiber; like wool, silk fiber, camel & Goat hair. (ii) Mineral fiber; like asbestos fiber. (iii) Vegetable fibre; like cotton & jute fiber. Man-made fiber known as manufactures fiber. They can be classified two groups. (i) Manmade fiber; like Viscose rayon, Acetate rayon (ii) Synthetic fiber; like Nylon, Polyester, Acrylic fiber. Synthetic fibers generally come from synthetic material such as petrochemicals.

B. Polyester Fiber

Polyester is a synthetic fiber. Polyester fiber looks like a smooth, glass rod similar to Nylon. The length, width and shape of the polyester fiber are controlled during manufactured to suit a specific end use. The dia. of PF is determined by (i) the rate of filament from the spinneret and (ii) The number of spinneret holes and therefore the number of filaments.

TABLE I
Properties of Textile Fiber

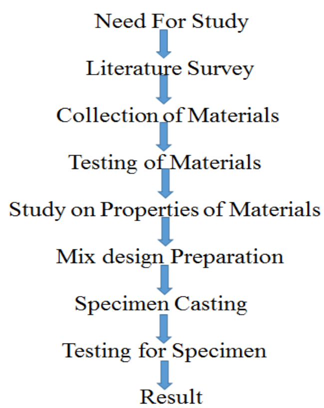
Properties	Fiber
Shape	Square
Colour used	White
Cut Length	10mm to 20mm
Specific Gravity	1.35 -1.39

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue III Mar 2020- Available at www.ijraset.com

C. Fly-Ash

Fly ash is a heterogeneous by-product material produced in the combustion process of coal used in power stations. It is a fine grey coloured powder having spherical glassy particles that rise with the flue gases. As fly ash contains pozzolanic materials components which reach with lime to form cementatious materials. The chemical composition of fly ash depends upon the type of coal used and the methods used for combustion of coal. The specific gravity of fly ash ranges from a low value of 1.90 for a sub-bituminous ash to a high value of 2.96 for an iron-rich bituminous ash. The flyash is a very fine material, the particle size ranges in between 10 to 100 micron. The shape of the fly ash is usually spherical glassy shaped. The colour of the fly ash depends upon the chemical and mineral constituents. Lime content in the fly ash gives tan and light colours whereas brownish colour is imparted by the presence of iron content. A dark grey to black colour is typically attributed to an elevated un-burned content.

II. METHODOLOGY



III. MATERIALS USED

A. Cement

Cements used in construction are usually inorganic, often lime or calcium silicate based, and can be characterized as either hydraulic or non-hydraulic, depending on the ability of the cement to set in the presence of water.
Cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel together. Cement mixed with fine aggregate produces mortar for masonry, or with sand and gravel, produces concrete. Cement is the most widely used material in existence and is only behind water as the planet's most-consumed resource.

B. Fine Aggregate

Both river sand and crushed stones (M sand) may be used. Coarser sand may be preferred as finer sand increases the water demand of concrete and very fine sand may not be essential in High Performance Concrete as it usually has larger content of fine particles in the form of cement and mineral admixtures such as fly ash, etc. The sand particles should also pack to give minimum void ratio as the test results show that higher void content leads to requirement of more mixing water.

C. Course Aggregate

Coarse aggregates are components found in many areas of the construction industry. They have structural uses such as a base layer or drainage layer below pavements and in mixtures like asphalt and concrete. This lesson explores the various types of coarse aggregates. The coarse aggregate sample taken for study and the physical properties of coarse aggregate. For coarse aggregate, crushed 12mm normal size graded aggregate was used. The specific gravity and water absorption of coarse aggregate were found to be 2.68 and 1.0%, respectively. The grading of coarse aggregate conforms to the requirement as per IS: 383 – 1970.The coarse aggregate is the strongest and least porous component of concrete. Coarse aggregate in cement concrete contributes to the heterogeneity of the cement concrete and there is weak interface between cement matrix and aggregate surface in cement concrete. By usage of mineral admixtures, the cement concrete becomes more homogeneous and there is marked enhancement in the strength properties as well as durability characteristics of concrete.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue III Mar 2020- Available at www.ijraset.com

D. Water

Water is an important ingredient of concrete as it actively participates in the chemical reactions with cement. The strength of cement concrete comes mainly from the binding action of the hydrated cement gel. The requirement of water should be reduced to that required for chemical reaction of un hydrated cement as the excess water would end up in only formation of undesirable voids in the hardened cement paste in concrete. From High Performance Concrete mix design considerations, it is important to have the compatibility between the given cement and the chemical/mineral admixtures along with the water used for mixing.

E. Concrete Grading

Ordinary Portland cement 53 grade was used for casting of all the specimens and clean dry M sand and natural course aggregates will be used. The clear M sand passing through IS 4.75 mm sieve the specific gravity of fine aggregate is 2.638. Then natural coarse aggregate with specific gravity of 2.836 and passing through IS 20 mm sieve. Cubes of 150x150x150 mm and cylinder of 150mm diameter and 300mm height and prism of 500x100x100mm were cast, cured and tested for 7 days, 14days and 28 days.

The investigation is conducted with standard 10% replacement of cement by fly ash and with addition of 3%,5% and 7% of textile fiber cloth piece in the concrete. For this composition the compressive strength, slit-tensile strength and tensile test is carried out.

F. Mix Design

TABLE III
Mix proportion ratio

Water (l/m^3)	Cement (Kg/m^3)	Fine Aggregate (Kg/m^3)	Course Aggregate (Kg/m^3)
198	438	664	1078
0.45 (w/c ratio)	1	1.5	2.5

IV. EXPERIMENTAL INVESTIGATION

A. Compressive Strength Test

This test method covers the deformation of cube compressive strength concrete specimen. The specimen is prepared by pouring freshly mixed concrete into lubricated cube moulds. Consolidation is done extremely over vibrating table for 1-2 minutes. After vibration and finishing, the moulds are kept at normal atmosphere conditions for 231/2 + ½ hours after which demoulding is done. The specimens are then cured in water tank.

The test is conducted at surface dry condition. The specimen is tested at the age for 7days, 14days and 28 days of curing under the compression testing machine.

Compressive Strength = (Max Load of collapse *1000)/Loaded surface area

Fig. 1 Compressive strength of Cube

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue III Mar 2020- Available at www.ijraset.com

The tests were carried out on a set of triplicate specimen and the average compressive strength values were taken.

TABLE IIIII
COMPRESSIVE STRENGTH OF CUBE OBTAINED

% addition of Textile waste cloth	7 day strength (N/mm^2)	14 day strength (N/mm^2)	28 day strength (N/mm^2)
0	18.61	19.22	48.22
3	21.58	23.66	52.12
5	20.93	22.53	50.12
7	20.31	22.01	49.25

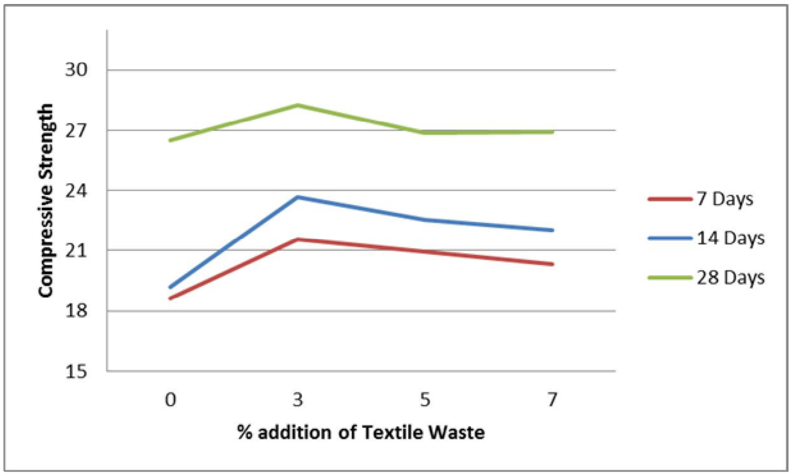


Fig. 2 Compressive strength of Cube

B. Split tensile Strength Test

Splitting tensile strength test was conducted on concrete cylinders to determine the tensile nature of carbon black concrete. The wet specimen was taken from water after 28 days of curing. The surface of specimen was wiped out. The weight and dimensions of the specimen was noted. The cylinder specimen was placed on compression testing machine. The load was applied. The test consists of applying a compressive line load along the opposite generators of a concrete cylinder placed with its axis horizontal between the compressive plates. Due to the compression loading a fairly uniform tensile stress is developed over nearly 2/3 of the loaded diameter as obtained from an elastic analysis.

Split tensile strength $=2P/(\pi dl)$

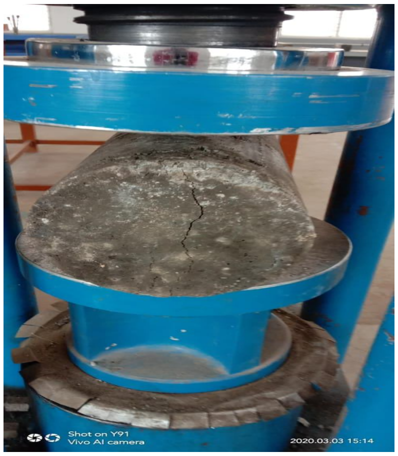


Fig. 3 Split tensile strength of cylinder

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue III Mar 2020- Available at www.ijraset.com

TABLE IVV
Split Tensile strength of Cylinder obtained

% addition of Textile waste cloth	7 day strength (N/mm^2)	14 day strength (N/mm^2)	28 day strength (N/mm^2)
0	2.86	*2.95*	*4.01*
3	*3.22*	*3.76*	*5.22*
5	*3.02*	*3.14*	*5.02*
7	*2.74*	*2.70*	*4.68*

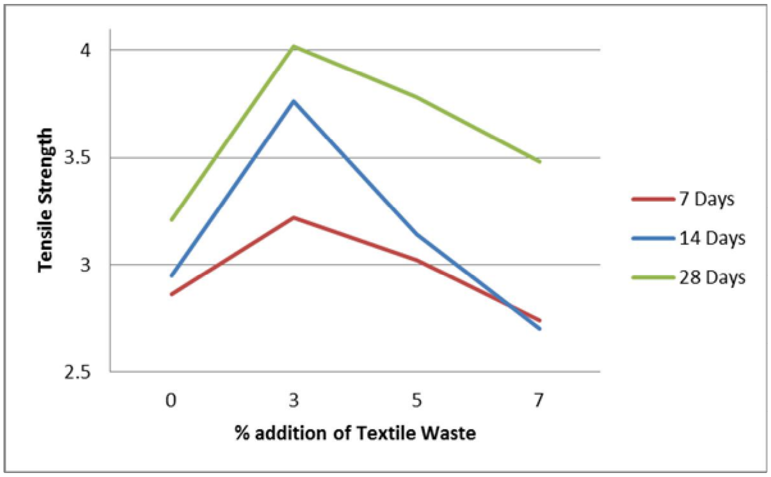


Fig. 4 Split tensile strength of cylinder

C. Flexural Strength

A beam specimen should be cast for determining the flexural strength of concrete. The standard speciman size is 10cm x 10cm x50cm. A flexural testing mechine is used for this test. The testing machine may be set to any reliable type of sufficient capacity for the test. Permissible eerrors should be not greater than +/- 0.5%. The bed of machine should be provided with tow steel rollers of 38mm deameter on which the specimen is suppported. Rollers are supported at a centre to centre distance of 60cm for the 15cm specimen and at 40cm for the 10cm specimen. The test specimen should be cured for 28days and tested ofr maximum load.

Flexural strength = PL/BD^2

Where, P= Ultimate load applied to specimen

L= Length of specimen

B&D = Breadth and depth of specimen

Fig. 5 Flexural strength of prism

TABLE V
FLEXURAL STRENGTH

% addition of Textile waste cloth	7 day strength (N/mm^2)	14 day strength (N/mm^2)	28 day strength (N/mm^2)
0	3.25	*5.33*	*6.66*
3	*3.50*	*5.89*	*6.71*

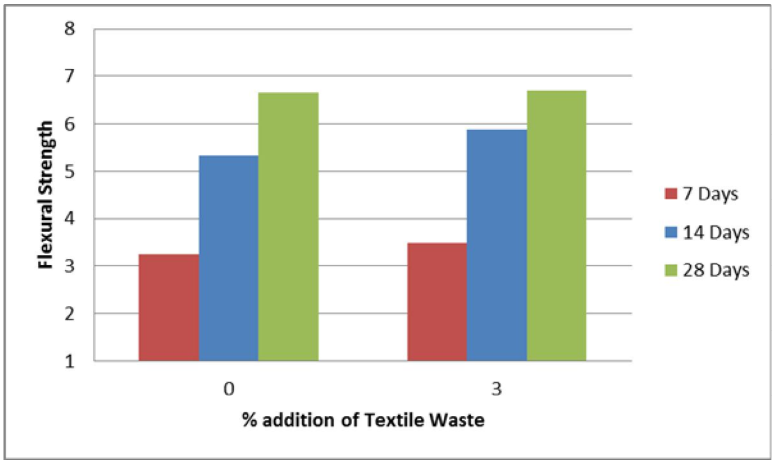


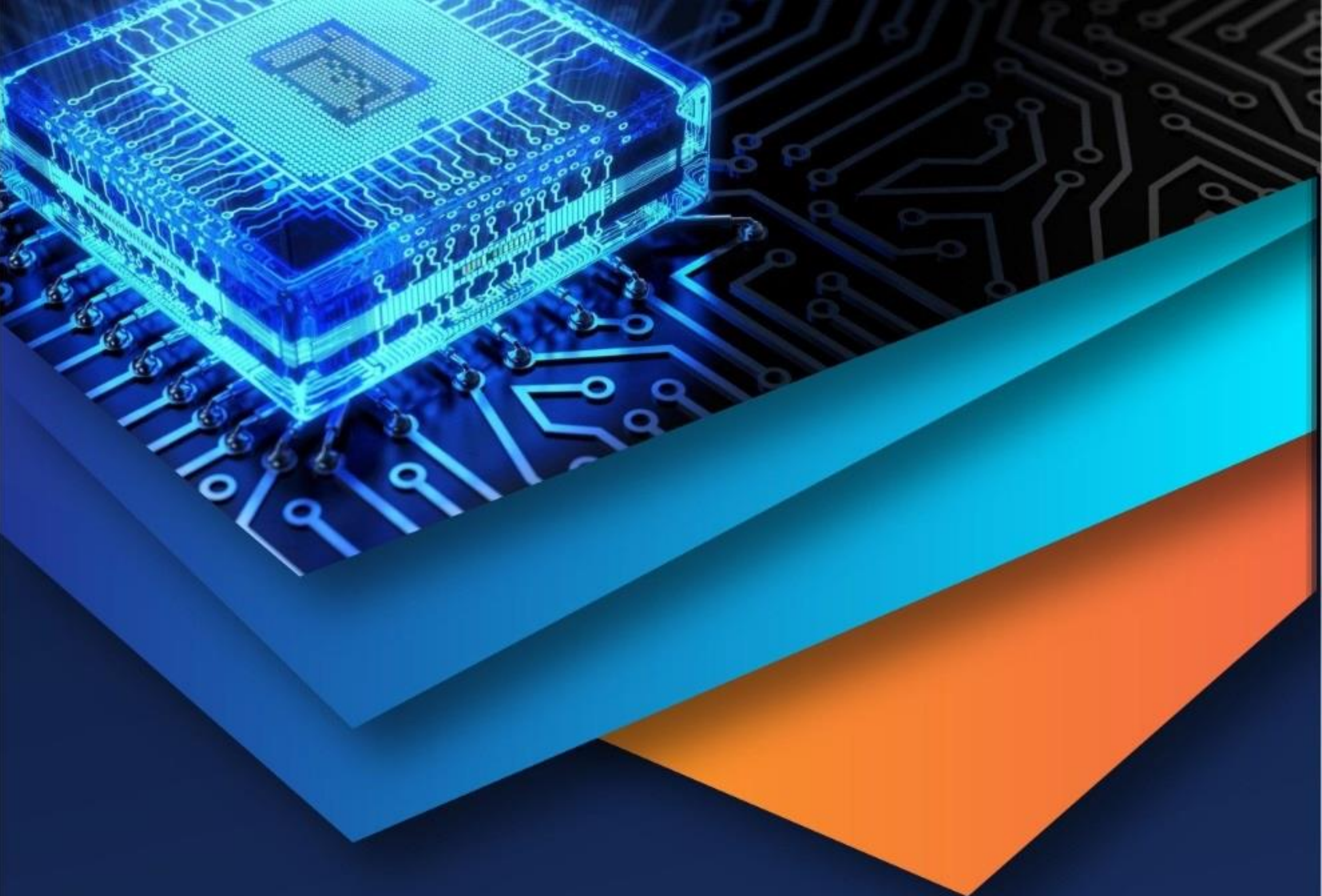
Fig. 3 Flexural strength of concrete

V. CONCLUSION

India has large amount of fly ash in generation all over the world. If this material is used properly many problems may be solved by the replacement fly ash. Use of cement and cost will be reduced. As well as the pollution in environment will be reduced. The experimental work has helped to know that replacement of flyash along with textile waste shows the considerable increase of strength up to 3% after there is a considerable reduction in strength. This shows that the optimum inclusion is maximum up to 3%.other properties of fly ash concrete and to develop various mix designs.

REFERENCES

[1] J.M.L. Reis, "Effect of textile waste on the mechanical properties of polymer concrete", Materials Research 21,PP63-69.,2009.
[2] R.M. Rowell, J.S. Rowell, "Characterisation and factors effecting fibre properties", Natural polymers and agro based fibers based composites.".,2000.
[3] DW. Fowler, "Polymer in concrete, a vision for the 21st century", Cement and concrete composites.,Vol.,pp 449-452.,1999.
[4] Habeeb G, and Mahumud H. "Study on properties of Rice husk and its Use as Cement Replacement Material" Materials Research, 2010;13(2):185-190.
[5] Kartini K. "Effects of silica in Rice Husk Ash(RHA) in producing High Strength concrete", Journal of Engineering and Research 2012;26:1951-1956.
[6] Shah, "Application of fiber reinforced concrete", Material Journal. Vol.88. 1991.
[7] IS-10262: 2009, "Indian Standard Code for concrete mix proportioning guidelines", (First Revision), Bureau of Indian Standards, New Delhi.
[8] IS-456: 2000, " Indian Standard Code for plain and reinforced concrete", (Fourth Revision), Bureau of Indian Standard, New Delhi.
[9] IS-383: 1970. "Indian Standard Code for specification for fine and course aggregaste", Bureau of Indian Standard, New Delhi.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429