International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 12 | Dec 2020 www.irjet.net p-ISSN: 2395-0072

An Experimental Investigation on High Strength Self Compacting Concrete using Jute Fibre

A. Abdul Hameed[1], S.Sasidharan[2]

[1]*Assistant Professor, Department of Civil Engineering, Nandha Engineering College, Tamilnadu, India*
[2]*PG Student, Department of Civil Engineering, Nandha Engineering College, Tamilnadu, India*

Abstract - Self-Compacting Concrete gets compacted due to its own self weight. It has more benefits compared to ordinary concrete. Workability and strength of (SCC) with jute fibre have to been carried out by experimental investigations to determine different characters. In cement concrete vegetable fibres coir and jute have been examined for their suitability for incorporation. Jute is a natural fibre obtained from a plant like pineapples, and during harvest the leaves are cut as close to the ground. By hand or machine the soft tissues are scrapped from the fibres. The fibres are dried and brushes to remove the remaining dirt. After dried and brushes the fibre resulting in a clean fibre. The concrete is required to have properties like high strength, high durability, high serviceability and long life of concrete structures. There are some tests involving in various fibre proportions for a particular mix design of SCC. Test methods like slum test, flow test and compacting factor test are used to study the properties of fresh concrete. The test method like casting cube, cylinder and beams after curing of 7 and 28 days are used to find the properties like Compression, Tensile and Flexural strength of SCC

Keywords: Self Compacting Concrete, Workability, Segregation, Aggregate, Admixture, Jute Fibber.

INTRODUCTION

Self-Compacting Concrete (SCC), which flows under its own weight . For compaction it does not require any external vibration. It has revolutionized concrete placement. SCC, was first introduced in the late 1980's by Japanese researchers. It is highly workable concrete , without segregation and bleeding it can flow under its own weight through restricted sections. The successful development of SCC must ensure a good balance between deformability and stability. For mixture proportioning, of SCC, which include reducing the volume aggregate to cementitious material , increasing the paste volume , increasing the water-cement ratio, controlling the maximum coarse aggregate, using various viscosity admixtures . SCC should have a relatively low yield value to ensure high flow ability, and must maintain its homogeneity during transportation. During placing and curing it should ensure its adequate structural performance and also it should maintain its long term durability. In placement of SSC is more faster compared to normal concrete and very less man power is required.

Superplasticizers plays an important role in SSC to maintain its high mobility. Viscosity modifying admixture is used to eliminate segregation .This project describes a procedure specifically developed to achieve self-compacting concrete. The test results for self-compacting concrete is slump flow, V-funnel and L-Box. Further, the compressive strength for 7-days and 28-days are also presented. It helps to increase bonding with reinforcement as like traditional concrete. Comparing to ordinary concrete the surface finish and mechanical property is also high in SSC.

This project I clearly explained about the self-compacting concrete with jute fibre to increase the strength of concrete in the area where the ordinary concrete cannot be placed

OBJECTIVES

1) To determine the workability slump cone, u-tube, L-box test, V-funnel test are done

2) To study about the strength character like compressive, flexural and split tension strength are gone.

3) While using jute fibres in SCC the strength and behavior of SCC must be studied.

4) BY using standard codes the study of mix proportion for SCC material with jute fibres are learned

LITERATURE REVIEW

GENERAL

In this chapter, an discussion is made regarding works done so far in this area as literature review. The review is about Experimental Investigation on High Strength Self Compacting Concrete Using Jute

High Strength Self Compacting Concrete Using Jute

Jasmine Jeba P, et.al,(2017) says Concrete is a mixture of cement, sand, gravel and water which dries hard and strong and is used as a material for building. Concrete has to be heavily vibrated for flow into very intricate forms or forms that have a lot of reinforcing bars.

Hence to overcome these defects the self-cony acting concrete is used. Self-compacting concrete is a flowing concrete mixture that is able to consolidate under its own weight. The self-compacting concrete flows easily at suitable speed into formwork without blocking through the reinforcement without being heavily vibrated. This project deals with the self- compacting concrete where the cement is partially replaced with fly-ash and silica fume. Here Ordinary Portland Cement is replaced with 5%, 10%, 15%, 20% and 25% of fly-ash and 2.5%, 5%, 7.5%, 10% and 12.5% of silica fume. From the experimental investigations, it is observed that there is increase in the fresh properties (workability) and increase in the hardened properties (split-tensile strength and compressive strength) for replacement of silica fume. Similarly, there is increase in the fresh properties (workability) and decrease in the hardened properties (split-tensile strength and compressive strength) for replacement of fly ash.

Harpreet Singh(2018) The use of jute fibre as reinforcement for development of composite materials has increased in nowadays because the vexation shown by the environment due to increase in fuel prices, depletion of fossil fuels, global warming are the major concerns which force the researchers to work in the area of green composites. The jute fibre reinforced composites also replace old materials such as steel and wood. The current research ingenuity aims to highlight the concerns and challenges faced during the development of jute fibre reinforced composites. Fabrication methods of different form of jute fibre reinforced composites have been studied and their mechanical properties have been reported. Failure mechanism of jute fibre composites has been discussed using scanning electron microscopy

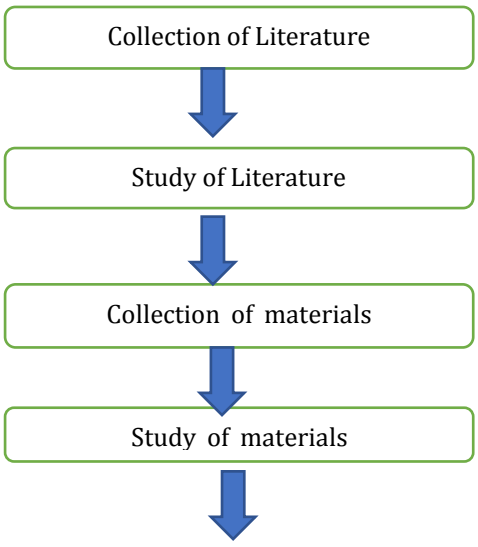
Danar Altalabani (2020) This research examines the mechanical characteristics of self-compacting lightweight concrete (SCLC) produced with limestone powder and reinforced by polypropylene fibre. The compressive strength, impact resistance, elastic modulus, splitting tensile strength, and flexural strength are measured at the ages of 28 days, and the toughness index of the specimens is determined from load-deflection relationships. The test results reveal that adding fibre does not affect the compressive strength, but it slightly improves the elastic modulus and the splitting tensile strength. The impact resistance and flexural properties show the most remarkable improvement; this enhancement is more superior when macro and hybrid fibre are added instead of a single microfibre with a greater improvement when the highest macro fibre content is used in the hybrid concrete specimens.

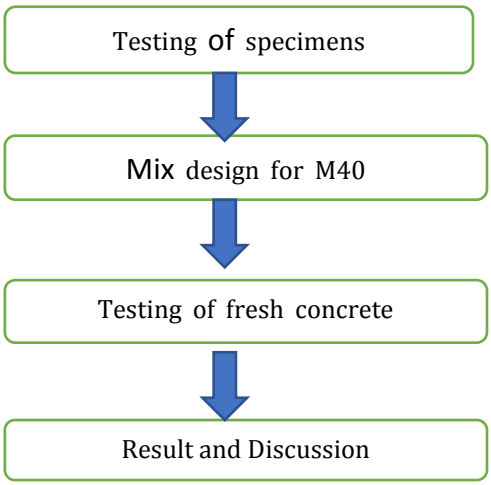
Pratyush Kumar, Rahul Roy (2017) the essentiality of self -compacting concrete can be understood from the fact that there is an increasing problem of lack of skilled labor in the construction industry. The benefit of SCC is that it provides faster construction period and allows an early development of strength for concrete. The above paper deals with flexure and flow properties of self -compacting concrete reinforced with a combination of steel with sisal and abaca fibre. Three percentages of sisal (0.5%, 1%, 1.5%) or three of abaca (0.5%, 1%, 1.5%) are mixed with a uniform 0.3% and 0.6% of steel fibre. Split tensile strength and flexure strength are evaluated at 7 days and 28 days for various specimens of self -compacting concrete made by variation of fibre provides an understanding of mechanical properties and tests like Slump flow, J –ring and U-box test are performed for an understanding of flow of self-compacting concert.

Mayank Gupta (19 July 2019)- This research investigates the effect of nano silica and coir fibre on compressive strength and abrasion resistance of concrete. In this study, Coir fibre has been added in the concrete with the variation of 0.25%, 0.5%, and 0.75% by the weight of the fine aggregates and 2% and 3% nano silica along with 15% fly ash which has partially replaced cement in the concrete mixture. Different samples with varying percentages of nano silica and coir fibre have been prepared to keep water to binder ratios like 0.47, 0.45 and 0.42 for calculating the compressive strength and abrasion resistance and results have been compared with the controlled specimens. It is reported that the optimum dosage of coir fibre and nano silica is 0.25% and 3%, respectively which provides approximate equal abrasion resistance as compared to the conventional concrete sample.

METHODOLOGY

MATERIAL TESTING





i)CEMENT : The normal OPC 43 grade conforming in IS code book (IS 10262:2009, IS8112:1989) was used in this experimental study.

Properties:

Specific gravity of cement	3.15
Normal consistency	30%
Initial setting time(min)	30
Fineness modulus (m^2/kg)	225

FINE AGGREGATE

River sand or M sand is used which is passing through (4.75 mm) sieve. The fine aggregate should be tested according to IS code (IS 2386 : 1983)

Properties:

Specific gravity	2.654
Bulk density (kg/m^3)	1600
Fineness modulus	2.75

COURSE AGGREGATE

The fine angular (crushed granite) course aggregate which is passed through the 12.5 mm sieve should be used according to the IS code of (IS 2386:1983)

Properties:

Specific gravity	2.68
Bulk density (kg/m^3)	1700

WATER: Water is the most important thing for construction. It is used for curing, mixing of mortar and concrete. The clean and clear drinking water is used for construction purpose .According to code book IS456:2000 ph value is ≈ 7

ADMIXTURE Conplast sp430, Gleniumb233 are used for strength and bonding purpose and viscosity modifying agent

JUTE FIBRE

India is the large jute producing country. Jute is an important best fibre with a more advantages. Jute has high specific properties, low density, less abrasive behaviour to the processing equipment. Jute fibre is good dimensional stability and harmlessness. The compressive and flexural strength is high compared to normal reinforced concrete.

Properties:

Water absorption	200
Tensile strength (Mpa)	260
Elongation	1.23%

FRESH CONCRETE TEST

V-Funnel test

The V-funnel test was developed in Japan and used by Ozawa, et al 5 . The equipment consists of a V-shaped funnel. The funnel is filled with concrete and the time taken by it to flow through the apparatus measured. This test gives account of the filling capacity (flowability). The inverted cone shape shows any possibility of the concrete to block is reflected in the result.

L.BOX test

The L-box test method uses a test apparatus comprising a vertical section and a horizontal trough into which the concrete is allowed to flow on the release of a trap door from the vertical section passing through reinforcing bars placed at the intersection of the two areas of the apparatus .The concrete ends of the apparatus H1 and H2 measure the height of the concrete

at both ends. The L-box test can give an indication as to the filling ability and passing ability

EFFECT OF FIBRE IN CONCRETE

Fibre are usually used in concrete to control plastic shrinkage cracking and drying shrinkage cracking. They also lower the permeability of concrete and thus reduce bleeding of water. Some types of fibre produce greater impact, abrasion and shatter resistance in concrete. Generally fibre do not increase the flexural strength of concrete, so it cannot replace moment resisting or structural steel reinforcement. Some fibre reduce the strength of concrete

CONCLUSION

Considering the economy and the durability of conventional concrete structures, it is observed that the quality and the density of the concrete, as well as the compaction of the concrete are main parameters that cause deterioration. For this, SCC offers new possibilities and prospects. For this, SCC offers new possibilities and prospects. Thus the results is improved by using the jute fibre technology. It improves the range of Compression Strength, flexural strength compared to the normal concrete. The comparison is done for 7 and 14 days for conventional concrete. Maximum 20% of the range can be improved by using the jute fibre technology. Which has been implemented by next phase. In future the following process are going to be done,

- Testing of Compressive Strength, Split Tensile Strength and Flexural Strength for SCC and SCC Using Jute Fibre

- Deflection Test for Conventional Beam, SCC Beam and SCC Using Jute Fibre Result

RESULT AND DISCUSSION

As per study of SCC the result obtained is

S.no	Mix Ratio	7 Days N/mm^2	14 Days N/mm
1	1:1.65:2.45	5.5	7.1
2		4.8	7.3
3		5.2	6.9

REFERENCES

[1] Dinesh. A*, Harini.S, Jasmine Jeba.P, Jincy.J, Shagufta Javed "Experimental Study on Self Compacting Concrete"

[2] Mayank Gupta, Maneek Kumar Department of Civil Engineering, Shri Guru Gobind Singhji (SGGS) Institute of Engineering and Technology, Vishnupuri, Nanded, Maharashtra, India ,Department of Civil Engineering, Thapar University, Patiala, Punjab, India "Effect of nano silica and coir fibre on compressive strength and abrasion resistance of Concrete"

[3] Harpreet Singh , Jai Inder Preet Singh ,Sehijpal Singh, Vikas Dhawan ,Sunil Kumar Tiwari 1 Assistant Professor, School of Mechanical Engineering, Lovely Professional University, Phagwara 144402, Punjab, India c Principal, Guru Nanak Dev Engineering College, Ludhiana, India , Director Principal, CGC Landran, Greater Mohali, India "A Brief Review of Jute Fibre and Its Composites"

[4] Pratyush Kumar*, Rahul Roy VIT university, Vellore, India. "Study and experimental investigation of flow and flexural properties of natural fibre reinforced self-compacting concrete"

[5] Danar Altalabani, Dillshad K.H. Bzeni, Stefan Linsel "Mechanical properties and load deflection relationship of polypropylene fibre reinforced self-compacting lightweight concrete".

[6] Krishna Murthy. N, Narasimha Rao. A.V, Ramana Reddy I. V and Vijaya Sekhar reddy. M, Mix design procedure for self-compacting concrete, IOSR Journal of Engineering, Vol 2, Issue 9(2012), PP 33-41.

[7] Fareed Ahmed Memon, Muhd Fadhil Nuruddin and Nasir Shafiq(2013), Effects of silica fume on fresh and hardened properties of fly ash based self-compacting geopolymer concrete, International journal of minerals, metallurgy and materials, Volume 20, No 2, Page 205.

[8] Dhiyaneshwaran. S, Ramanathan. P, Baskar. L and Venkatasubramani. R (2013), Study on durability characteristics of self-compacting concrete with fly ash, Jordan journal of civil engineering, Volume 7, No 3.

[9] B. Mahalingam and K. Nagamani(2011), Effect of processed fly ash on fresh and hardened properties of self-compacting concrete, International journals of earth science and engineering, ISSN 0974-5904, Vol. 04, No. 05.

[10] Kennouche. S, Zerizer. A, Benmounah. A, Hami. B, Formulation and characterization of self-compacting concrete with silica fume (2013), Journal of Engineering and technology Research, Vol. 5(5), p.p. 160-169.

[11] Mallikarjuna Reddy. V, Seshagiri Rao. M. V, Srilakshmi. P, Sateesh Kumar. B, Effects of W/C ratio on workability and mechanical properties of High strength self compacting concrete(2013), International journal of engineering research and

development, Vol. 7,Issue 1, PP. 06-13.J. Breckling, Ed., The Analysis of Directional Time Series: Applications to Wind Speed and Direction, ser. Lecture Notes in Statistics. Berlin, Germany: Springer, 1989, vol. 61.

[12]. ASTM D570-98, Standard Test Method for Water Absorption of Plastics, ASTM International, West Conshohocken, PA, 1998,

[13]. IS: 4031 (Part 4)–1988. Methods of physical tests for hydraulic cement. Part 4. Determination of consistency of standard cement paste. Bureau of Indian Standards. New Delhi, India, Reaffirmed; 2005.

[14]. IS: 4031 (Part 5)–1988. Methods of physical tests for hydraulic cement. Part 5. Determination of initial and final setting Times. Bureau of Indian Standards. New Delhi, India, Reaffirmed; 2005.