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Feasibility Study of Self Curing Steel Fiber Reinforced Concrete with Respect to Cost & their Properties

Kadam Shital[1], A. W. Dhawale[2]
[1, 2]*Civil Engineering Department, Savitribai Phule Pune University, JSPM's Imperial College of Engineering & Research Pune, Maharashtra*

Abstract: ***While we think about the usage of conventional steel it required extra time for construction & professional labor to apply reinforcement. Also quantity of traditional steel required is more so, price of construction of material also get increases. Therefore in an effort to reduce the exertions price we will update conventional steel to steel fiber, as it is easy & quicker to apply so it can store time & value of exertions.***

These days the demand of potable water is growing due to developing populace & industrialization. But some area of our country is like where we have problem of even drinking water. Earlier than it turns in to severe crisis, we need to find alternative to this problem. One manner for that we need to mitigate the usages of water in construction operations. The purpose of the assignment is to relieve the water issue via using self curing concrete & reduce construction price via changing traditional steel to steel fiber.

This study deals use of PEG-400 in concrete with 1% of steel fiber by varying percentage of 0%,0.5%,0.75%,1%,1.25% by weight of cement for M30 mix. The concrete is tested to find out the durability properties. Also cost comparison is made by taking current market price of material & labor cost.

Keywords: Self curing, PEG-400, Steel fiber, Durability properties, Cost Comparison

I. INTRODUCTION

Due to the expanding human population the need of construction is also increases. Construction required lot of water for mixing, curing, etc. But as we know our country is facing lot of problem in supplying even drinking water therefore construction industries are trying to find alternative curing methods to save water & also to promote construction industry. So in order to reduce quantity of water required for curing we can use PEG-400. In order to reduce maintenance & repair cost of building, structure should be durable as enough. Durable structure not only reduces the maintenance cost but also it improves the serviceability & utility value of structure. Durable structure gives the safety & comfort to the users. So in this paper we check effect of PEG-400 & steel fiber on durability property.

II. PROBLEM STATEMENT

As the population of India increases day by day progressively the need of housing also increases. According to the need Indian construction industries increased & also it becomes important indicator of the development as it creates investment opportunities across various related sector. But at the time of development it demands the quality construction within less time & minimum cost. In order to fulfill this requirements technical changes in conventional concrete by using PEG-400 & steel fiber.

III. OBJECTIVES

The objective is to study the durability properties of self-curing concrete reinforced with steel fiber. For percentage of PEG-400 such as 0.5%, 0.75%, 1%, 1.25% by the weight of cement for M30 grade concrete with 1% steel fiber. The objective

A. To determine durability property of self-curing concrete
B. To save water
C. Compare material, cost & time required for conventional & steel fiber reinforced concrete.

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IV. LITERATURE REVIEW

1) "Steel Fiber Reinforced Concrete: A Review", by Hamid Pesaran Behbahani$_1$, Behzad Nematollahi$_2$, Majid Farasatpour$_3$. (Dec 2011). This paper presents an overview of the mechanical properties of steel fiber reinforced concrete with its advantages & applications. After studying various literatures it shows that SFRC has significant improvement in flexural strength & toughness compared against conventional reinforced concrete.
2) "Durability Of Steel Fiber Reinforced Self-Compacting Concrete", by Cristina Frazao, Aires Camoes, Joaquim Barros And Delfina Goncalves. (May 2013). This paper develops SFRSCC sandwich panels & compares the performance of SFRSCC & self compacting concrete by conducting various durability tests. After conducting tests they conclude that, presence of steel fiber reduce the electrical resistivity of concrete. Also it does not affect on the water absorption.
3) "Comparison of Performance of Standard Concrete And Fibre Reinforced Standard Concrete Exposed To Elevated Temperatures", by K.Srinivasa Rao$_1$, S.Rakesh kumar$_2$, A.Laxmi Narayana$_3$ (2013). This paper gives comparison of performance of standard concrete & fiber reinforced concrete when exposed to heat. Five sets of standard concrete & fiber reinforced concrete are exposed to temperature of 50c, 100c. 150c. 200c, & 250c for 3 hours & sixth set is tested at room temperature as control concrete. They observe increase in compressive strength & tensile strength. SFRC found more compressive, Spit tensile & Flexural strength at all temperature.
4) "Structural application of steel fibers reinforced concrete with & without conventional reinforcement", by Tian Sing Ng1,2, Trevor Nyan Soe Htut2. (Oct 2017). This paper presents a few fundamental ideas governing the structural design of FSRC based at the to be had design codes, Beginning from type of various varieties of steel fibers, That have profound impact on the overall performance of concrete structures, The simple constitutive fashions are provided allowing engineers & designer to design FSRC.
5) "An Overview on Characteristics of Self-Curing Concrete Using Polyethylene Glycol-400 (PEG)", by Ankita Arsude 1, Prof. Dr. A. W. Dhawle 2. (March 2018). This paper makes study of different literatures related to self curing concrete & its behavior. It concludes that, with the use of self curing concrete is done, which is not only done by mixing water but also by curing water.

V. MATERIALS

1) *Cement:* The cement used for this experimental work is Ultra-tech 53 grade ordinary Portland cement. Grade 53 has good quality & durable. Specific gravity of cement was 3.15.
2) *Crushed Sand:* Locally available manufactured sand was used for this experiment. Specific gravity of sand was 2.8.
3) *Coarse Aggregate:* 20mm maximum size locally available aggregate was used for mix having specific gravity 2.85.
4) *Water:* Drinking water is used for mixing of concrete.
5) *Steel Fiber:* 1mm diameter & 50mm length steel fiber was used for this experiment having tensile strength 800-900Mpa.
6) *Polyethylene Glycol-400:* PEG-400 which is easily soluble in water & having density about 1.1-1.2 is used for this experimental work.

VI. EXPERIMENTAL WORK

A. *Mix Proportion*

For durability test mix proportion with PEG-400 & steel fiber is given below

TABLE I
Mix Proportion (KG/CU.M)

1	Cement	Birla super OPC 53 grade	437.78kg
2	Crushed Sand	Crushed fine Aggregate	700.5kg
3	20mm	Crushed Coarse Aggregate	1161.7kg
4	Water	Fresh bore well Water	197kg
5	Steel Fiber	Crimped Steel Fiber	4.377kg
6	PEG-400	Self curing agent	4.377kg

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B. Schedule of Casting of Durability Test

In this test total 12 number of specimen are casted with constant 1% of steel fiber & 1% PEG-400 for durability test. Schedule of casting for each test is given below.

TABLE II
Schedule Of Casting Of Durability Test

Item	Tests			
Cube	Water Absorption	HCL	Na_2SO_4	H_2SO_4
Specimen	3	3	3	3

VII. RESULT & DISCUSSION

A. Durability Test Result

Table III
Test Results Of Durability

Sr. No.	Name of test	Results
1	Water absorption Test	1.35%
2	H_2SO_4 Acid Attack Test	4.75%
3	HCL Acid Attack Test	2.92%
4	Na_2SO_4	0%

VIII. COST COMPARISON

Following cost comparison are taken by actual rates of building materials. Considering today's rates we have to make this comparison of conventional concrete with conventional steel & self-curing concrete with steel fiber.

Table IV
Cost Of 1m3 Of Conventional Concrete With Steel

Item	M30		
	Quantity	Rate	Amount
Cement (kg)	437.78	7	3064.46
20mm Aggregate(kg)	1175.05	6	7050.3
Labor cost to binding steel	One day		1400
Sand(kg)	707.56	3.5	2476.46
Water (Mixing)(lit)	197	0.1	19.7
Water (Curing)(lit)	3000	0.1	300
Total Cost			14308.92

Table V. Cost of 1 M3 of Self-Curing Concrete with Steel Fiber

Item	M30		
	Quantity	Rate	Amount
Cement (kg)	437.78	7	3064.46
PEG-400(lit)	4.377	350	1531.95
20mm Aggregate(kg)	1175.05	6	7050.3
Labor cost to binding steel Fiber	One day		0
Sand(kg)	707.56	3.5	2476.46
Water (Mixing)(kg)	197	0.1	19.7
Water (Curing)(kg)	00		0
Total Cost			14142.87

From above comparison it is conclude that cost difference between conventional reinforced concrete & self curing concrete with steel fiber is 166.05/m3

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IX. CONCLUSION

A. This concludes that 1% of PEG-400 & 1% of steel fiber give best results of durability properties.

B. Durability properties of specimen having size 150mm*150mm*150mm containing 1% of steel & 1% of PEG-400 by weight of cement were investigated.

C. We also studied effect of acid attack on concrete (H_2SO_4, HCL, Na_2SO_4) which also shows good result.

D. To the concrete mixture with 1% PEG-400 & 1% steel fiber shows better property result. Not only strong enough but also durable under different acid attacks & weather conditions.

E. The use of self curing concrete reduce the quantity of usage of water for curing hence such concrete can be used in drought region where there s more problem of water.

F. As the water in self curing concrete reduces it reduces cost of curing of water as for 1meter cube of conventional concrete we required 3meter cube of water.

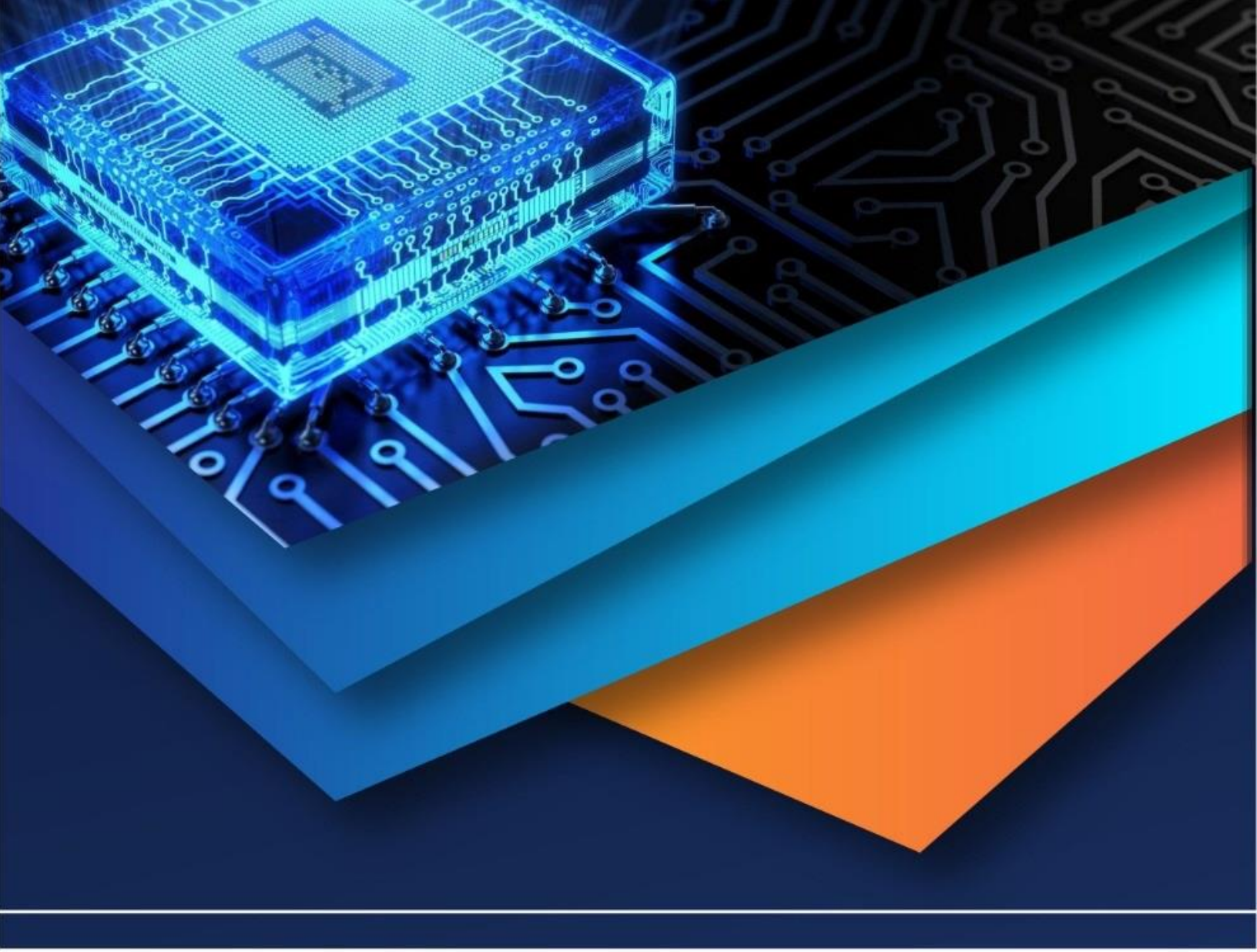
G. Self curing concrete with steel fiber reduces the labor cost of binding conventional steel as we use steel fiber reinforced concrete.

H. Self curing concrete with steel fiber also reduce the time of construction because it reduces the time required for binding steel as we use steel fiber by replacing conventional steel.

REFERENCES

[1] Ankita Arsude 1, Prof. Dr. A. W. Dhawle 2. -"An Overview on Characteristics of Self-Curing Concrete Using Polyethylene Glycol-400 (PEG)", (March 2018).
[2] B. Krishna Rao, professor v. Ravindra- "Steel fiber reinforced self- compacting concrete incorporating class f fly ash 2010".
[3] Cristina Frazao, Aires Camoes, Joaquim Barros And Delfina Goncalves -"Durability Of Steel Fiber Reinforced Self-Compacting Concrete", (May 2013).
[4] Cyril Cyriac- "Strength behavior of self-curing fly ash concrete using steel fibers and its analysis using ansys".
[5] Dhruvil shah, Prof. Dr. Nanak Pamnani, Maulik Limbasiya, Kishor Kavad, Ankur Adroja-". Compressive and tensile strength of self-curing concrete using steel fiber"
[6] Dr. Maragatham.S, Kokilavani.S , Lavanya.S, Meena.G, Ranjith Priya.r –" Self-compacting and self-curing concrete with steel fiber reinforcement 2018"
[7] Hamid Pesaran Behbahani$_1$, Behzad Nematollahi$_2$, Majid Farasatpour$_3$-"Steel Fiber Reinforced Concrete: A Review", (Dec 2011).
[8] http://theconstructor.org/building/smart materials/smart-nano- materials-in- construction-industry/5638
[9] IS: 12269:1987, Indian Standard Ordinary Portland cement
[10] IS: 383-1970, Indian Standard Specification For Course And Fine Aggregates From Natural Sources For Concrete.
[11] IS: 10262-1982, Indian Standard Concrete Mix Proportioning – Guidelines, Bureau of Indian Standards, New Delhi.
[12] IS 10262-1982-"Recommended guidelines for concrete mix design", Bureau of Indian standards
[13] IS 10262-2009-"Recommended guidelines for concrete mix design", Bureau of Indian standards
[14] IS 456-2000-"Indian standard plain R.C. code of practice", Bureau of Indian standards
[15] IS 12269:1987, "53 grade ordinary Portland cement", Bureau of Indian standard, New Delhi, September 1993.
[16] IS 5816:1999, "Method of tests Splitting tensile strength of concrete", Bureau of Indian standard, New Delhi
[17] IS 383:1970, "Specification for coarse and fine aggregates for natural sources of concrete", September 19 NPTEL.
[18] J. Balaji Braveen, S. Manju Soniya-"An experimental study on mechanical properties of steel fiber reinforced self-curing concrete"
[19] K.Srinivasa Rao$_1$, S.Rakesh kumar$_2$, A.Laxmi Narayana$_3$ -"Comparison of Performance of Standard Concrete And Fibre Reinforced Standard Concrete Exposed To Elevated Temperatures", (2013).
[20] K.Dasthagiri, D. Gayathri, T .Naresh Kumar-"Study on strength and durability properties of self-curing concrete incorporating peg- 400"
[21] K. Sumangala M. Banu Sulochana-"A review on self-curing concrete"
[22] Mohammed Naseem FairozKundgol, Vinayak Vijapur-"Study on internal curing of steel fiber reinforced concrete using super absorbent polymer"
[23] Mr. Ram Lohar, Mr. Bhagwat Deokar, Mr.Ambadas kale-" A study on internal curing of self-compacting concrete using admixture peg (400) & superplasticizers"
[24] M.V.Jagannadha Kumar (2012)- "Strength characteristics of self-curing concrete"
[25] Tian Sing Ng1,2, Trevor Nyan Soe Htut2-"Structural application of steel fibers reinforced concrete with & without conventional reinforcement", (Oct 2017).

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