

Study on Self Curing Concrete Using Liquid Paraffin Wax as External Agent

T. Rama Linga Reddy & M. Nageswararao

¹ Student of M.Tech in structural engineering , L.I.T.A.M Dhulipalla,Guntur dt.

² Assitant professor in the Department of civil engineering LITAM,Dhulipalla,Guntur dt.

Abstract:

Concrete is most widely used construction material due to its good compressive strength and durability. Curing plays a major role in developing the concrete microstructure and pore structure. Curing is the process of maintaining proper moisture content particularly within 28 days to promote optimum cement hydration immediately after placement. Good curing is not possible in most of the cases such as vertical members, human errors, places where there is scarcity of water, In such conditions self-curing concrete is very adaptable. One of the techniques of self-curing concrete is by using Hydrophilic materials (water loving, such compounds have an affinity to water and are usually charged or have polar side groups to their structure that will attract water).

1. Introduction

Commonly available Hydrophilic materials are Polyethylene Glycol, Paraffin Wax, Acrylic acid. The use of Hydrophilic materials minimizes the loss of water from the concrete and helps in continuous curing of concrete. In this study, considered grade of concrete is M40. The effect of variation in strength parameters i.e., Compressive Strength, Split Tensile Strength and Flexural Strength were studied with Liquid Paraffin Wax (self-curing agent) (0.1% weight of cement) and compared with that of conventional cured concrete. The admixture Conplast SP430 was added (0.3% weight of cement).The design mix proportion was 1:1.45:2.95.

(a) Self-Curing Concrete (SCUC):

Self-curing concrete is one of the special concretes in mitigating insufficient curing due to human negligence, scarcity of water in arid areas, inaccessibility of structures in difficult terrains and in areas where the presence of fluorides in water will badly affect the characteristics of concrete.

The concept of self-curing agents is to reduce the water evaporation from concrete and hence increase the water retention capacity of the concrete compared to conventional concrete.

It was found that Hydrophilic materials (water

loving. Such compounds have an affinity to water and are usually charged or have polar side groups to their structure that will attract water) such as Polyethylene Glycol, Paraffin wax, or Acrylic acid can be used as self-curing agents in concrete.

(b) Need of Self Curing:

Conventional curing is not possible in the following cases:-For the vertical member , In the places where there is scarcity of water such as Hill top etc., In the places where manual curing is not possible. In such cases, it may lead to the formation of crack in the member and hence affects strength and durability

2. Experimental investigation

To study the strength characteristics such as compressive strength, flexural strength, split tensile strength for M40 grade of concrete.

Total 18 cubes were casted with dosage of 0.1% of self-curing agent (liquid paraffin wax) under indoor and water curing conditions. Compressive strength test was conducted after 7, 14 and 28 days of curing.

Total 18 cylinders were casted with dosage of 0.1% of self-curing agent (liquid paraffin wax) under indoor and water curing conditions. Split tensile strength test was conducted after 7, 14 and 28 days of curing.

Total 18 prisms were casted with dosage of 0.1% of self-curing agent (liquid paraffin wax) under indoor and water curing conditions. Flexural strength test was conducted after 7, 14 and 28 days of curing.

The graphs plotted between strength (compressive strength, flexural strength, split tensile strength) and days of curing.

(a) Mix proportion

water	Cement	Fine Aggregate	Coarse aggregate
167.4	418.5	607.83	1235.98 (741.59 + 494.39)
0.4	1	1.45	2.95

(b) Quantities

Hence for 1 Cum of concrete	
-----------------------------	--

Cement	418.50 kg
Water	167.40 kg
Fine Aggregate	607.83 kg
Coarse Aggregate	1235.98 kg
20 mm	741.59 kg
10mm	494.39 kg
Paraffin wax	0.42 kg
Conplast SP430	1.26 kg

Nomenclature of mix	Curing Period		
	7 days (N/mm ²)	14 days (N/mm ²)	28 days (N/mm ²)
OPC + 0.3 % Conplast (Water curing)	3.82	4.53	5.49

3. Results

(a) Slump Test Results

Nomenclature of mix	Slump (mm)
OPC + 0.3 % Conplast	125 mm
OPC + 0.1 % lpw+ 0.3 % Conplast	110 mm

From the above graph, observed that there was a decrease in the percent of slump of 12 % in self-curing concrete when compared to conventional concrete.

(b) Compressive Strength Test Results

Nomenclature of mix	Curing Period		
	7 days N/mm ²	14 days N/mm ²	28 days N/mm ²
OPC + 0.3 % Conplast (Water curing)	23.30	36.78	48.07
OPC + 0.1 % lpw + 0.3 % Conplast (Air curing)	21.96	35.74	47.36

It was observed that there was reduction in compressive strength of self-curing concrete (air curing) of 5.75% when compared to conventional concrete (water curing) at 7 days.

It was observed that there was reduction in compressive strength of self-curing concrete (air curing) of 2.83% when compared to conventional concrete (water curing) at 14 days.

It was observed that there was reduction in compressive strength of self-curing concrete (air curing) of 1.48% when compared to conventional concrete (water curing) at 28 days.

(c) Split Tensile Strength of Conventional concrete

It was observed that, there was reduction in split tensile strength of self-curing concrete (air curing) by 7.33% when compared to conventional concrete (water curing) at 7 days.

It was observed that, there was reduction in split tensile strength of self-curing concrete (air curing) by 9.49% when compared to conventional concrete (water curing) at 14 days.

It was observed that, there was reduction in split tensile strength of self-curing concrete (air curing) by 6.19% when compared to conventional concrete (water curing) at 28 days.

(d) Flexural Strength results

Nomenclature of mix	Curing Period		
	7 days N/mm ²	14 days N/mm ²	28 days N/mm ²
OPC + 0.3 % Conplast	4.98	5.81	7.41
OPC + 0.1 % lpw+ 0.3 % Conplast	4.91	5.75	7.26

It was observed that, there was reduction in Flexural strength of self-curing concrete (air curing) by 1.41% when compared to conventional concrete (water curing) at 7 days.

It was observed that, there was reduction in Flexural strength of self-curing concrete (air curing) by 1.03% when compared to conventional concrete (water curing) at 14 days.

It was observed that, there was reduction in Flexural strength of self-curing concrete (air curing) by 2.02% when compared to conventional concrete (water curing) at 28 days.

4. Conclusion

The slump of Self Curing Concrete was decreased by 12% when compared to conventional concrete.

The compressive strength of Self curing concrete decreased by 1.48% when compared to

Conventional concrete.

The split tensile strength of Self curing concrete decreased by 6.19% when compared to Conventional concrete.

The flexural strength of Self curing concrete decreased by 2.02% when compared to Conventional concrete.

Strength of Self curing concrete is on par with conventional concrete.

5. Acknowledgements

This work was supported by M. Nageswar Rao M.Tech., Assistant professor in Department of civil engineering, L.I.T.A.M dhulipalla and principal and head of the department.

6. References

- 6.1 Amal Francis k#1, Jino John#2 “ Experimental Investigation on Mechanical Properties of Self Curing Concrete” International Journal of Emerging Trends in Engineering and Development Issue 3, Vol.2 (March 2013) , ISSN 2249-6149.
- i. C. Chella Gifta*1, S. Prabavathy2 and G. Yuvaraj Kumar2 “Study on Internal Curing of High Performance Concrete Using Super Absorbent Polymers and Light Weight Aggregates Asian Journal of Civil Engineering H C , vol. 14, no. 5 2 13 .
- ii. Garje ajesh Kumar “Self-Curing Concrete” ILEM Publications SA L, 2 11, IS N No. 978-2-35158-116-2.
- iii. M.V. Jaganadha Kumar, M. Srikanth, Dr.K. Jaganadha ao “Strength Characteristics of Self-curing Concrete” IJE T | Sep 2012
- iv. Sathanandham.T1,Gobinath.R2,NaveenPrabhu.M3,Gnanasundar.S3,Vajravel.K3,Sabariraja.G3, Manoj kumar.R3, Jagathishprabu. 3 “ Preliminary Studies of Self curing Concrete With the addition of Polyethylene glycol” IJE T, Vol. 2 Issue 11, November – 2013 ISSN: 2278-0181.