

Experimental Investigation & Comparative Study on Durability of Self Cured and Normal Cured Concrete

Sanjeevin. T

Department of Civil Engineering
Anna University Chennai

Abstract-Scarcity of potable water increases day by day. The use of self curing agent is very important from the point view that water resources are getting valuable every day. Curing of concrete means maintaining moisture inside the body of concrete during the early ages and beyond in order to develop the desired properties in terms of strength & durability. A good curing practice involves keeping the concrete damp until the concrete is strong enough to do its job. This article summarizes various aspects of Self curing of concrete which can be of valuable assistance in adopting good construction practices at site. This paper reports the results of a research study conducted to evaluate the effect of self curing method on the durability of self compacting concrete (SCC). Cube specimens were prepared and cured by covering them with a curing compound and normal water. The sorptivity and acid attack tests were conducted on the concrete specimens and compared the Durability of normally cured SCC and SCC cured with self curing material i.e. wax based, white pigmented, membrane forming concrete curing compound.

Key words- Concrete, comparative study, durability

I. INTRODUCTION

The concept of self curing is to reduce the water evaporation from concrete and hence increase the water retention capacity of the concrete compared to conventional concrete. Efficient curing improves the strength and durability of concrete. Concrete curing compounds is considered to be most important since curing of concrete is a major challenge in the construction industry. Enough water needs to be present in a concrete mix for the hydration of cement to take place. When the concrete is exposed, water evaporates from its surface, The factors those influences the evaporation are atmospheric temperature, wind velocity, relative humidity, type of cement, initial temperature of the concrete and more importantly free w/c ratio of the mix. The use of various chemicals in concrete alters the properties like strength and durability. A durable concrete is one that performs satisfactorily in the working environment during its anticipated exposure conditions during service. The materials and mix proportions specified and used should be such as to maintain its integrity and, if applicable, to protect embedded metal from corrosion. Due to the vast construction activities different grades of concrete with natural and artificial ingredients are in use. In addition to the standard ingredients a number of mineral and chemical admixtures are used in the preparation of concrete. The dosage of these admixtures is comparatively more in high

grades of concrete especially in ready mixed concrete. Well designed concrete may give poor durability if not properly cured and on the other hand a moderately designed concrete if well cured can give a better durability. Hence importance of curing should never be ignored. So, prolonged curing is a must which leads to enhanced durability. The advancements in the construction and chemical industry have paved way for the development of the new curing techniques and construction chemicals such as Membrane curing compounds, Self-curing agents, Wrapped curing, Accelerators, Water proofing compounds etc. With the growing scale of the project conventional curing methods have proven to be a costly affair as there are many practical issues and they have been replaced by Membrane curing compounds and Self-curing agents up to some extent as they can be used in inaccessible areas, Vertical structures, Water scarce areas etc. It is most practical and widely used curing method.

II. SELF CURING CONCRETE

As per IS:456-2000 "Curing is the process of preventing the loss of moisture from the concrete." Self curing concrete is the one which can cure itself by retaining its moisture content. A concrete can made to self cure by adding curing admixtures or by the application of curing compounds

III. EXPERIMENTAL INVESTIGATION

To understand the behavior of curing on the Durability of concrete by normal curing and external self curing i.e. by applying curing compounds on concrete surface this work has been done. In this experimental work, two tests are performed i.e. 1. Sorptivity test, 2. Acid attack test. The mix design is carried out using Nan-su Method for M70 grade of self compacting concrete. Tests are conducted on 18 no. of standard cubes of 100 x 100 x 100 mm size, which are casted in the laboratory.

IV. MATERIALS USED

1. Cement

53 grade ordinary Portland cement is conforming to IS: 12269-1987 having specific gravity 3.15 is used.

2. Fine Aggregate

Locally available river sand conforming to I.S. passing from 4.75 mm, having Specific gravity 2.60, Fineness Modulus

2.783 is used for this study. Particle size distribution is given in table 1.

Table 1: Particle size distribution

IS sieve size	Weight retained gm	Cumulative Weight retained gm	Cumulative % Weight retained gm	Cumulative % Passing
4.75 mm	00	00	00	100
2.36 mm	117	5.85	5.85	94.15
1.18 mm	364	18.2	24.05	75.75
0.6 micron	762	38.1	62.15	37.85
0.3 micron	536	26.8	88.95	11.05
0.15 micron	168	8.40	97.35	2.65
Pan	53	2.65	100	00
Total	2000 gm			

3.Coarse Aggregate

Coarse aggregate used in this study are passed from 16mm and retained on 10mm. Specific gravity of coarse aggregate used is 2.9.

4.Filler

It improves the durability of the concrete by reinforcing the microstructure through filler effect and reduces segregation and bleeding. It also helps in achieving high early strength. So silica fume having specific gravity 2.38 is used as a filler material. Chemical composition of silica fume is given in Table no. 2

Table 2. Chemical composition of silica fume

Sr. No.	Constituents	Quantity (%)
1	SiO ₂	91.03
2	Al ₂ O ₃	0.39
3	Fe ₂ O ₃	2.11
4	CaO	1.5
5	LOI	4.05

5.Water

Water is an important ingredient of concrete as it actually participates in the chemical reaction with cement. Ordinary potable water available in the laboratory is used.

6.Superplasticisers

GLENIUM B233 from BASF company is used as Superplasticiser . It complies with IS: 9103– 1999.The properties are

Table 3. BASF Glanium B233

Aspect	Light brown
Relative Density	1.08 ± 0.01 at 25°C
PH	>6
Chloride ion	<0.2%

V. TESTSCONDUCTEDONSCC

Self Compact ability tests on SCC Tests on fresh concrete were performed to study the workability of SCC with silica fume. The tests conducted and their results are listed below:

Table 5: Properties of Fresh Concrete

Sr. No.	Method	Unit	Typical range of values		Result
			Min	Max	
1	Slump-flow	mm	650	800	665
2	T50 slump flow	Sec	2	5	3
3	V-funnel	Sec	6	12	8
4	L-Box	(h ₂ /h ₁)	0.8	1.0	0.98

VI. SUMMARY AND FUTURE WORK

All knows normal curing method seems to be the best method for curing giving maximum strength. But by using curing compounds also we can achieve almost 90% strength which achieved by normal curing method. So there is not major strength loss. In the first phase complete literature review, material collection and some basic test

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