Study on Different Types of Curing Methods on Compressive Strength of Concrete

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Abstract- *Concrete is the most widely used man-made material in the world. Concrete derives its strength by the hydration of cement particles. The Curing allows continuous hydration of cement and consequently continuous gain in the strength. 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, Water proofing compounds, Autoclavecuring, also making curing pads etc.*

Was obtained for M30 grade concrete according to IS 10262:2009 Guidelines.To check the compressive strength.

Keywords- Compressive strength,M30 grade,using SAP

I. INTRODUCTION

Curing of Concrete

Curing is the process of controlling the rate and extent of moisture loss from concrete during cement hydration. It may be either after it has been placed in position (or during the manufacture of concrete products), thereby providing time for the hydration of the cement to occur. Since the hydration of cement does take time – days, and even weeks rather than hours – curing must be undertaken for a reasonable period of time if the concrete is to achieve its potential strength and durability. Curing may also encompass the control of temperature since this affects the rate at which cement hydrates. The curing period may depend on the properties required of the concrete, the purpose for which it is to be used, and the ambient conditions, i.e. the temperature and relative humidity of the surrounding atmosphere. Curing is designed primarily to keep the concrete moist, by preventing the loss of moisture from the concrete during the period in which it is gaining strength. Curing may be applied in a number of ways and the most appropriate means of curing may be dictated by the site or the construction method.

1I. IMPORTANCE OF CURING

Curing is the process of controlling the rate and extent of moisture loss from concrete to ensure an uninterrupted hydration of Portland cement after concrete has been placed and finished in its final position. Curing also ensures to maintain an adequate temperature of concrete in its early ages, as this directly affects the rate of hydration of cement and eventually the strength gain of concrete or mortars.

Curing of concrete must begin as soon as possible after placement & finishing and must continue for a reasonable period of time as per the relevant standards, for the concrete to achieve its desired strength and durability. Uniform temperature should also be maintained throughout the concrete depth to avoid thermal shrinkage cracks. Also, protective measures to control moisture loss from the concrete surface are essential to prevent plastic shrinkage cracks. In a nutshell, curing process is designed primarily to keep the concrete moist by controlling the loss of moisture from the body of concrete, during the given period in which it gains strength.

Reasons to Cure Concrete

There are several important reasons why one should cure concrete:

Concrete strength gain - Concrete strength increase with age as moisture and a favourable temperature is present for hydration of cement. An experimental investigation was conducted by "Cement, Concrete & Aggregates Australia" (CCAA) and the same was published in their data sheet on "Curing of Concrete," which has been included in this article for reference. Figure-1.7 illustrates a comparison of the strength of concrete at 180 days of moist curing with various periods of moist curing (0, 3, 7, 14 & 28 days) and then allowing it to dry out. From the graph below, it can be observed that concrete allowed to dry out immediately, achieves only 40% of the strength of the same concrete water cured for the full period of 180 days.

Scope of The Project Work

The scope of this project can be summarized as obtaining an end product that will facilitate economical and eco-friendly method of slab curing, help the achieve design strength,

In scarcity period water is not available in more quantity. which method of curing is sutaible in that area is also known.

Various absorbing materials are tested for water absorption capacity and wear and tear. Tests are performed on the product and results are compared with those of conventional method

What is GGBS

GGBS (Ground Granulated Blast-furnace Slag) is a cementitious material whose main use is in concrete and is a by-product from the blast-furnaces used to make iron.

Blast-furnaces operate at temperatures of about 1,500°C and are fed with a carefully controlled mixture of iron ore, coke and limestone. The iron ore is reduced to iron and the remaining materials form a slag that floats on top of the iron.

A by-product from the blast-furnaces used to make iron.

This slag is periodically tapped off as a molten liquid and if it is to be used for the manufacture of GGBS it has to be rapidly quenched in large volumes of water. The quenching optimises the cementitious properties and produces granules similar to a coarse sand. This 'granulated' slag is then dried and ground to a fine powder.

Fly ash

Fly ash, flue ash, coal ash, or pulverised fuel ash (in the UK) – plurale tantum: coal combustion residuals (CCRs) – is a coal combustion product that is composed of the particulates (fine particles of burned fuel) that are driven out of coal-fired boilers together with the flue gases. Ash that falls to the bottom of the boiler's combustion chamber (commonly called a firebox) is called bottom ash. In modern coal-power plants, fly ash is generally captured by electrostatic precipitators or other particle filtration equipment before the flue gases reach the chimneys. Together with bottom ash removed from the bottom of the boiler, it is known as coal ash.

WATER CURING

POCEDURE 1

- Make a M30 grade concrete block
- Replace cement 20% by GGBS
- Replace cement 30% by GGBS
- Replace cement 40% by GGBS

PROCEDURE 2

- Replace cement 20% by FLY ASH
- Replace cement 30% by FLY ASH
- Replace cement 40% by FLY ASH

Casting Cube

Curing Cube

Testing Cube

III. RESULT

WATER CURING

❖ **Normal concrete block M30**

SR.NO	LOAD KN/M	7 DAYS (COMP STRENGTH N/MM^2)	AVG COMP STRENGTH N/MM^2
1	533	23.7	
2	542	24.1	23.9
3	537	23.9	

SR.NO	LOAD KN/M	14 DAYS (COMP STRENGTH N/MM^2)	AVG COMP STRENGTH N/MM^2
1	774	34.4	
2	767	34.1	34.4
3	780	34.7	

- **Replace 20%,30%,40% CEMENT by GGBS**

REPLACE 20% GGBS SR.NO	LOAD KN/M	7 DAYS COMP STRENGTH N/MM^2	AVG COMP STRENGTH N/MM^2
1	569	25.3	
2	564	25.1	25.06
3	558	24.8	
REPLACE 30% GGBS			
1	501	22.3	
2	526	23.4	23.06
3	528	23.5	
REPLACE 40% GGBS			
1	486	21.6	
2	513	22.8	21.8
3	472	21.0	

REPLACE 20% GGBS SR.NO	LOaD KN/M	14 DAYS COMP STRENGTH N/MM^2	AVG COMP STRENGTH N/MM^2
1	765	34	
2	776	34.5	34.26
3	771	34.3	
REPLACE 30% GGBS			
1	760	33.8	
2	753	33.5	33.8
3	767	34.1	
REPLACE 40% GGBS			
1	747	33.2	
2	758	33.7	33.23
3	738	32.8	

- **Replace 20%,30%,40% CEMENT by FLY ASH**

REPLACE 20% FLY ASH SR.NO	LOAD KN/M	7 DAYS COMP STRENGTH N/MM^2	AVG COMP STRENGTH N/MM^2
1	551	24.5	
2	564	25.1	24.4
3	531	23.6	
REPLACE 30% FLY ASH			
1	492	21.9	
2	531	23.6	22.76
3	513	22.8	
REPLACE 40% FLY ASH			
1	436	19.4	
2	506	22.5	21.02
3	488	21.7	

REPLACE 20% FLY ASH SR.NO	LOAD KN/M	14 DAYS COMP STRENGTH N/MM^2	AVG COMP STRENGTH N/MM^2
1	769	34.2	
2	762	33.9	34.13
3	771	34.3	
REPLACE 30% FLY ASH			
1	753	33.5	
2	742	33	33.26
3	749	33.3	
REPLACE 40%FLY ASH			
1	735	32.7	
2	744	33.1	32.8
3	733	32.6	

IV. CONCLUSION

From numerical results and discussion it is observed that

1. It is observe that GGBS is good replacement for cementious material in concrete.
2. Addition of 20%,30%,40% GGBS in concrete and cured in water curing its acquire more strength compare with replacement of flyash.
3. Compare the result of replacement of GGBS and FLY ASH of 7 days and 14 days.
4. The workability is to be improved by fresh concrete up to 30% replacement of GGBS.
5. If we increase replacement percentage offly ash the compressive strength will be decrease as compare with normal concrete block(OPC).
6. If we increase replacement percentage of fly ash the compressive strength will be decrease as compare with normal concrete block(OPC)

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