

Comparitive Study Between the Compressive Strength of Traditional Curing and Accelerated Curing of Concrete

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Abstract: Generalized association between compressive strength achieved after 28 days and accelerated compressive strength achieved after 24 hours for all the grades of concrete is provided in IS Code. This paper intent at evolving the comparison between accelerated action curing and traditional action curing for specific grade of concrete.. These techniques are particularly helpful within the manufacture trade, wherein high early age strength permits the removal of type work at intervals twenty four hours, thereby reducing the cycle time, leading to value saving edges. The most usually adopted natural process techniques are steam natural process at region pressure, heat water natural process, boiling water natural process and autoclaving. Accelerated curing results are obtained after twenty four hours to predict the twenty eight days compressive strength.

Key words: Concrete mix, Compressive Strength, Accelerated Curing, formwork, Autoclaving

I. INTRODUCTION

The Ultimate Compression that the concrete can bear is calculated on the basis of 28 days trial to find the quality of the Construction work. The procedure to calculate the quality of construction work in terms of 28 compressive strength stand in need of 28 days of water curing, before performing above trial experiment. If the Compressive strength is not meeting the target strength to be achieved, The replacement of Concrete mass becomes very difficult and practically impossible. But the 28 days compressive strength can be achieved by the method of accelerated curing as per code IS 9013-1978 within 1 day. This paper intents at comparing the ultimate compressive strength of the sample concrete after twenty eight days of traditional curing and boiling water method of accelerated curing. The result developed during this study is helpful for hard the strength of concrete in around one day as against twenty eight days.

II. MATERIALS

A. **Cement:** Ordinary Portland cement of fifty three grade [IS: 12269-1987], Specifications for 53Grade Ordinary Portland cement has been utilized in the study. It had been procured from a single supply and keep as per IS: 4032 – 1977. Care has been taken to ensure that the cement of same company and same grade is used throughout the investigation. The cement therefore procured was tested for physical properties in accordance with the IS: 12269 – 1987.

B. **Fine Aggregate:** The fine aggregate used was regionally on the market M-sand without any organic impurities and orthodox to IS: 383 – 1970. The fine particulates were tested as prescribed by the IS: 2386 – 1963

C. **Coarse Aggregate:** The chosen aggregates were crushed in angular shape and well hierarchal in nature. Hierarchal mixture is additionally vital significantly to forged concrete in predominantly full reinforcement or form work having little dimensions. These were tested as per IS 383-1970.

III. METHODOLOGY:

Mix Proportion: The mix proportion was done based on the IS Code 10262-2009. The design for mix proportion for M35 normal grade of concrete was prepared in lieu with the methodology . Nine cubes were prepared for each water cement ratio. Out of that 6 cubes were under examination for the compressive strength post 7days and then again after 28 consecutive days water curing and the 3cubes has been tested for its compressive strength on the next day of cube casting in which curing has been done with Acceleration curing as per IS-9013-1978.

Methods of curing:

A) Normal Water Curing:

The samples under examination were kept in moist air possessing 90% relative humidity at normal atmospheric conditions for 10 hours. Then they were noted and detached from the molds and instantly plunged in clean water. The curing is done in 7, 14, 21and 28 days.

B) Accelerated curing:

The cubes has been un moulded after 24hrs and immersed in acceleration curing tank of water with 100° C. After curing for 3 ½ hours specimen is cooled down by plunging in water kept at 27+2°C for a standard time of one hour. The subsequent formula is employed to seek out the 28 days compressive strength after testing in CTM.

$$R_{28} = \text{Strength calculated 28 days} = 8.09 + 1.64 R_a$$

Where,

R_a is designated as the Accelerated Curing Strength in MPa.

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IV. RESULTS AND DISCUSSION

S.No	Name of the test	Observed value	Standard value as IS-10262:2009
1	Normal Consistency (%)	32%	-
2	Time of setting(min) Initial Setting condition Final Setting condition	90 min 300 min	Not less than 30 Minutes Not more than 600 Minutes
3	Specific Gravity Cement Fine Aggregate Coarse Aggregate	3.15 2.6 2.7	2.5-3.0 2.5-3.0
4	Compressive strength (N/mm ²) A) 3 Days B) 7 Days	14N/mm ² 33.5 N/mm ²	IS: 1489-1991(Part-I) 16 N/mm ² 33 N/mm ²
5	Soundness (Lechatliers method)	3mm	Not more than 10mm

Table 1: Physical Properties of the Materials

IS Sieve mm	% Passing	Remarks
4.75	97.2	Confirms to grading Zone-III of table 4 IS383-1970
2.3	94.5	
1.18	81.2	
600×10 ⁻³	59.6	
300×10 ⁻³	21.5	
150×10 ⁻³	7.1	

Table 2: Sieve Analysis for Fine Aggregate

IS Sieve	% Passing	Remarks
80	100	Confirms table II of IS383- 1970
40	100	
20	100	
12.5	71.6	
10	28	
Pan	0.4	

Table 3: Sieve Analysis for Coarse particle Aggregates

The mix proportion is designed as per IS 10262-2009 considering various factors like
 Exposure Normal
 Degree of Quality control Good
 Slump 40-70
 Standard Deviation 5

Depending upon the above considerations the the Target mean strength required at 28 days is 43.25 Mpa. Depending upon the strictly controlled water cement ratio 0.45 and the casting in the lab with cement content by keeping 425Kg/m³ was made The mix with the following proportions per meter cube by weight is given as

Water/ cement	Cement (Kg)	FA (Kg)	CA (Kg)	Compressive strength (N/mm ²) Normal Curing in days	Compressive strength (N/mm ²) Accelerated Curing in days
0.45	425	807.3	984.15	33.50	39.72
0.50	425	807.3	984.15	29.78	35.88
0.55	425	807.3	984.15	17	28.72
0.60	425	807.3	984.15	15	26.56

	1	1.89	2.31	7	28	7	28
0.45	425	807.3	984.15	33.50	39.72	NA	44.00
0.50	425	807.3	984.15	29.78	35.88	NA	41.56
0.55	425	807.3	984.15	17	28.72	NA	33.82
0.60	425	807.3	984.15	15	26.56	NA	29.17

Table 4: Mix proportion and compressive strength

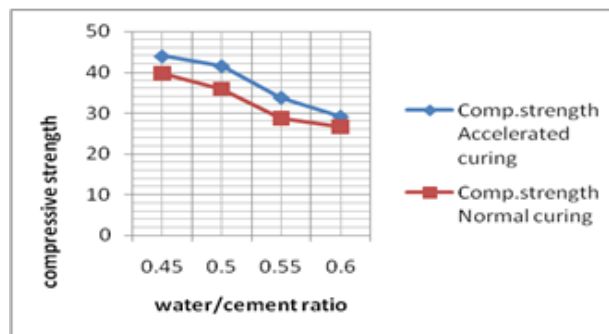


Figure:1 Comparison graph between the compressive strength of Accelerated curing and Normal curing cubes.

From the tabulation it is observed that for 0.45w/c ratio is giving good compressive strength to the concrete for this designed proportion. When the W/C ratio is getting increased and the strength is getting decreased. On the other hand, when it is required to have good slump, as the admixtures are not included here, the water cement ratio of 0.5 can be suggested. Comparing the Compressive strength of normal curing and Accelerated curing, the later one is giving good strength and it can also be used to achieve good compressive strength.

V. CONCLUSIONS:

In this experimental work a complete variety of 36 cubes were casted, out of which 24 were tested for Immersion natural process. Remaining 12 cubes were examined for Accelerated heat water technique

From the experimental outcomes it was concluded that the Immersion curing accomplished a mediocre strength under compression of 39.72 N/mm² and 35.88 N/mm² for M 35 grade at the age process of 28 days considering the W/C ratio as 0.45 and 0.5 respectively. The compressive strength of the concrete cubes was found to be 44 N/mm² and 41.56 N/mm² for W/C ratio 0.45 and 0.5 respectively for M 35 grade. Accelerated curing method is enabling to get good compressive strength comparatively.

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