

Effects of Different Types of Curing on Strength of Concrete

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ABSTRACT: This experiment work was carried out to investigate the effect of concrete strength in terms of compressive strength for M25 and M30 concrete by adopting immersion curing, wet gunny bags curing and steam curing as per IS 10262 – 2009. Traditionally quality of concrete in construction work is calculated in terms of its 28 days compressive strength. This procedure requires 28 days of moist curing before testing which is too long a period to be of any value for either concrete construction control or applying timely corrective measures. What is essentially needed for assessing quality of controlled concrete is an acceptance test which can supply result within about 24 hrs. after casting. With the assistance of reliable test methods employing steam curing techniques it is now possible to test the compressive strength of concrete within a short period. The result of investigation demonstrate that superior strength is achieved by Immersion curing than the other two types of curing. But the strength achieved in steam curing within 6 hours is nearby to Immersion curing.

KEYWORDS: Immersion curing, membrane curing, steam curing and compressive strength.

I. INTRODUCITON

Concrete is a construction material which has been used in construction industry. Curing is the process in which the concrete is protected from the loss of moisture and kept within a reasonable temperature range. This process results in concrete with increased strength and decreased permeability. Curing is also a key player in mitigating cracks. Traditionally, the quality of concrete in construction work is calculated in terms of its 28 days compressive strength. If after 28 days the quality of concrete is found to be dubious, it would have considerably hardened by that time and also might have been buried by subsequent construction. The need for having a reliable and fast method for evaluating controlled concrete in the field using steam curing techniques was recognised by cement and concrete sectional committee. Steam curing is method by which high early strength is achieved in concrete. These techniques are especially useful in the prefabrication industry where in high early strength enables the removal of form work within 24 hours thereby reducing the cycle time resulting in cost saving benefit.

II. MATERIAL TEST RESULTS

Test Description	Results
Specific gravity of cement	3.05 (PPC)
Consistency of cement	34.6%
Initial setting time of cement	87 min
Final setting time of cement	4 hrs 10 min
Specific gravity of fine aggregate	2.70
Specific gravity of coarse aggregate	2.8

III. MIX PROPORTION

Mix	Cement	Fine Aggregate	Coarse Aggregate	Water
M25	1	1.72	2.96	0.48
M30	1	1.62	2.83	0.45

IV. EXPERIMENT SETUP

After the cube casting is done, moulds are left undisturbed and kept in a place free from vibrations for 24 hours prior to immersion in the curing tank. After removing moulds, 18 cubes were gently placed in the curing tank and shall remain totally immersion for a period of 28 days. Another 18 cubes are wrapped in wet

gunny bags and tied with ropes and kept for 28 days. Remaining 6 cubes are cured with steam curing for a period of 6 hours.

V. RESULT AND DISCUSSION

In this experimental work, total number of 42 cubes were cast and tested. Out of these 18 cubes were tested for Immersion curing and membrane curing respectively. Remaining 6 cubes were tested for steam curing method.

Table-3

Curing methods`		Immersion curing (N/mm ²)			Membrane curing (N/mm ²)			Steam curing (N/mm ²)
		7	14	28	7	14	28	
Curing in days								6 hr.
Grade of concrete	M25	21.63	26.67	32.5	19.46	25.06	31.6	32.0
	M30	26.67	36.00	38.6	25.33	34.22	36.8	37.33

Target mean strength of M25 = 31.6 N/mm²
 Target mean strength of M30 = 38.25 N/mm²



Compression Testing Machine (200 tonne)

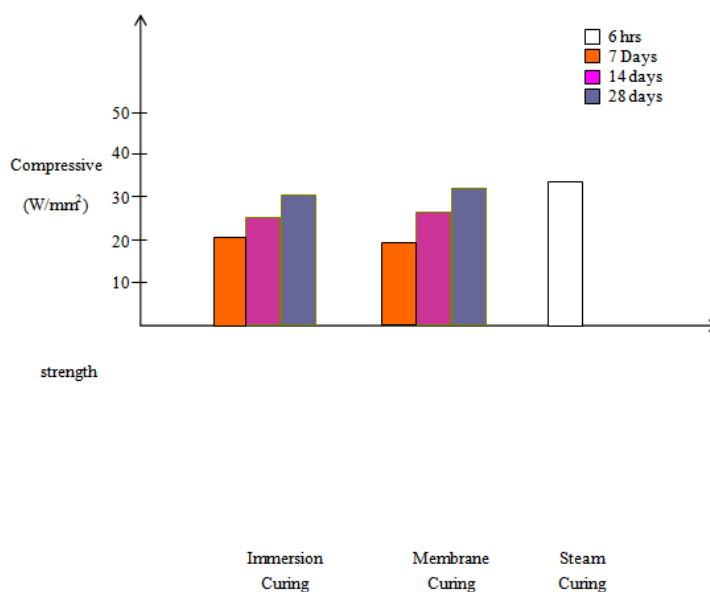


Fig-1 Average compressive strength of M25 grade of concrete for different types of curing.

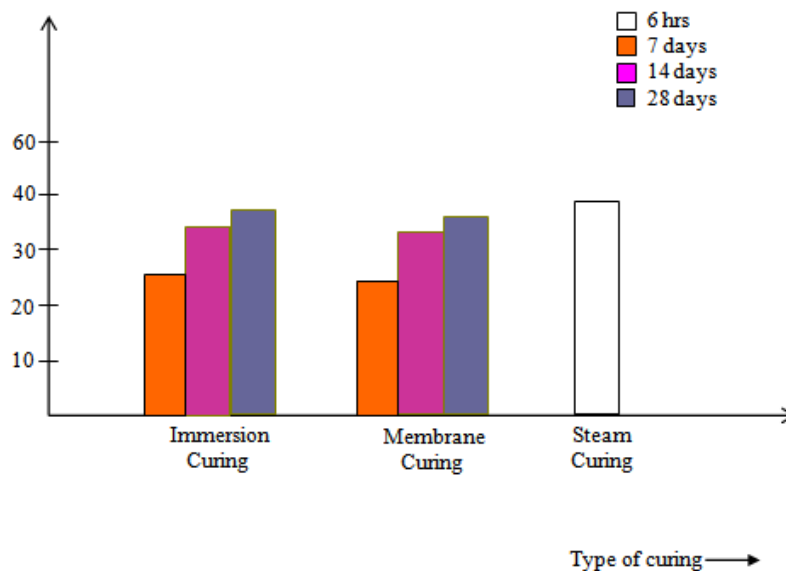


Fig-2 Average compressive strength of M30 grade of concrete for different types of curing.

VI. CONCLUSION

From the experimental test result the following conclusion were made.

- 1) The Immersion curing and membrane curing attained a avg, compressive strength of 32.5 N/mm^2 and 31.6 N/mm^2 respectively for M25 grade of concrete at the age of 28 days. At the same age. the Immersion curing and membrane curing attained a avg. compressive strength of 38.6 N/mm^2 of concrete and 36.8 N/mm^2 respectively for M30 grade of concrete.
- 2) From the experimental values it can be concluded that the optimum strength of concrete for compressive strength was achieved by adopting immersion curing method.
- 3) But as immersion curing is not practically possible the strength is being compared with membrane curing which is practically done in site.
- 4) Since the variation in results, while compared to all three methods of curing are very closed to the actual value and also the results of steam curing can be obtained within 6 hours. it is strongly recommended to use in prefabrication industry to obtain quick results and reduce the expenses.
- 5) From the experimental results, it can be concluded that from the steam curing of 6mm average compressive strength of 32 N/mm^2 is obtained for M25 grade of concrete. At the same time period, from steam curing average compressive strength of 37.33 N/mm^2 is obtained for M 30 grade of concrete.

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