A Study on the Effect of Curing over Concrete of Different Grade

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Abstract

Since we have been developing at the greater pace, due to which our traditional methods which were adopted for construction are missing somewhere, as the process of curing with water at normal or room temperature were adopted. This process of creation of an environment during a relatively short period immediately after the placing and compaction of the concrete, favorable to the setting and the hardening of concrete, is termed curing. These days, we have accelerated curing methods or steam curing methods which proved to be very beneficial.

In this project, we tried to study the effect of curing over different grade of concrete if curing is done for the extended time period than normal.

Keywords: Concrete Grade, Curing, Compression Strength

1. Introduction

The physical properties of concrete depends largely on the extent of hydration of cement and the resultant microstructure of the hydrated cement. Upon coming in contact with water , the hydration of cements proceeds both inwards and outwards in the sense that the hydration product gets deposited on the outer periphery of the cement grains, and the nucleus of the unhydrated cement inside gets gradually diminished in volume. At any stage of hydration, the cement paste consists of the product of hydration (called gel because of its larger area), the remnant of the unreacted cement, Ca(OH)2 and water. The product of hydration forms a random three-dimensional network gradually filling the space originally occupied by the water. Accordingly, the hardened cement paste has a porous structure, the pore sizes varying from very small (4 x 10-10m) to very large and are called gel pores and capillary pores. As the hydration proceeds, the deposit of hydration products on the original cement grains makes the diffusion of water to the unhydrated nucleus more and more difficult, and so the rate of hydration decreases with time. Therefore, the development of the strength of concrete, which starts immediately after setting is completed, continues for an indefinite period, though at a rate gradually diminishing with time. Eighty to eighty five per cent of the eventual strength is attained in the first 28 days and hence this 28-day strength is considered to be the criterion for the design and is called characteristic strength.

2. Material and Methods

For this study the various type of materials used in casting the different grade of concrete i.e. M20, M25, M30, M35 are: fine aggregate, course aggregate, cement, water at normal temperature. Before

using the material in the design of the mix various test were performed over the materials matching the IS code specification.

For the study 3 cubes of each grade were casted, i.e. 12 cubes in total were casted and mix design were prepared as per IS code.

2.1 Curing of Specimens

Specimens are removed from the moulds after 24 hours and cubes specimens cured in water for another 1, 3 and 27 days resp. (3 cubes each) after that compressive strength test were performed over the sample respectively.

2.2 Compressive Strength Test

Total 12 number of test specimens of size 150 x 150 x 150 mm were prepared for testing the compressive strength concrete in which for each grade 3 samples were prepared of same sizes. After completion of their curing period the test were performed.

3. Result and Discussion

3.1 Compressive Strength Test

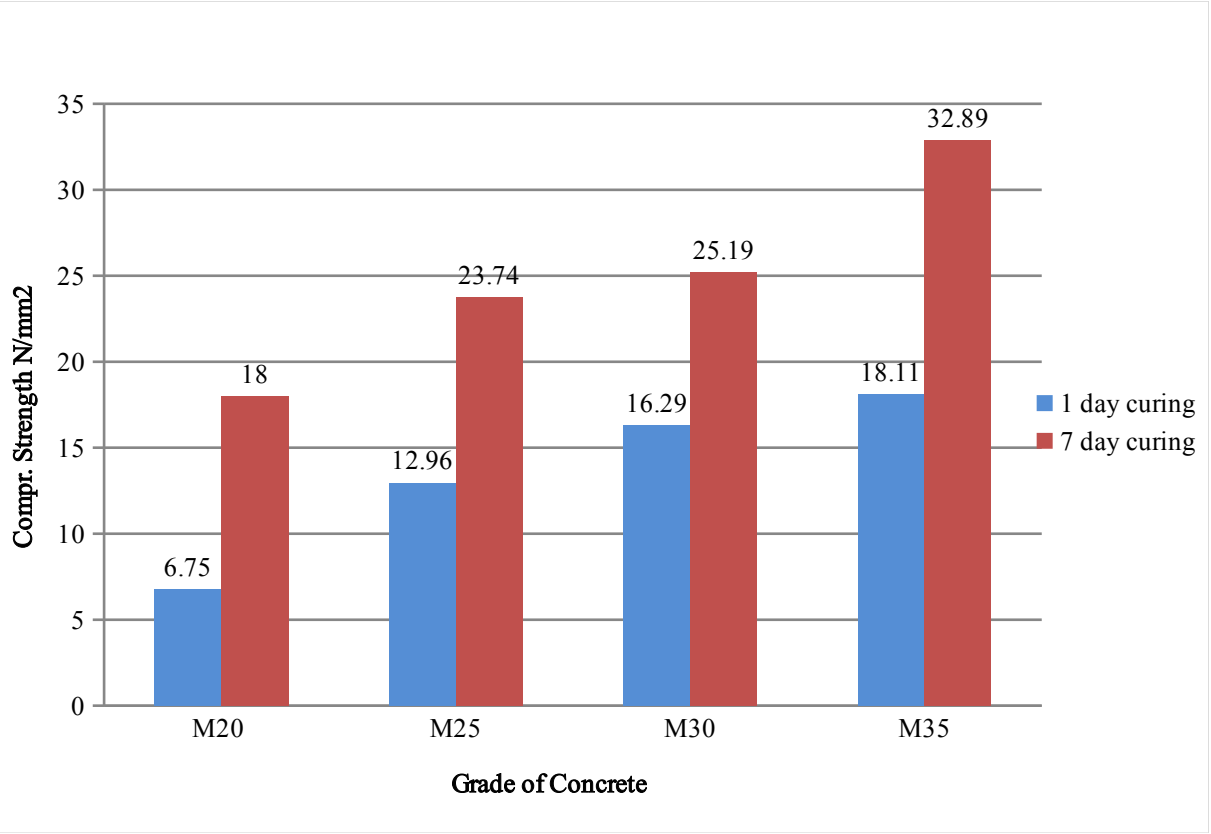
3.1.1 Result after 7 Days

We used OPC cement of grade 43 for the casting of cubes. 12 number of test specimens of size 150 x 150 x 150 mm were prepared for testing the compressive strength concrete. The test were performed only after the sample was air dry after taking out from curing tank. The result of the sample after 1 and 7 days is discussed in below table 1.1:

Table 1: Compressive Test Result after 7 days

Sr. No.	Grade of Concrete	No. of Days of Curing	Compressive Strength (N/mm^2)
1	M_{20}	01	6.75
2	M_{20}	07	18
3	M_{25}	01	12.96
4	M_{25}	07	23.74
5	M_{30}	01	16.29
6	M_{30}	07	25.19
7	M_{35}	01	18.11
8	M_{35}	07	32.89

Figure 1: Variation of 7 Days Compressive Strength with Curing Period



From the above, it may be concluded that there is increase in the target mean strength even after the curing of 7 days compared to that of the day 1.

3.1.2 Result after 28 Days

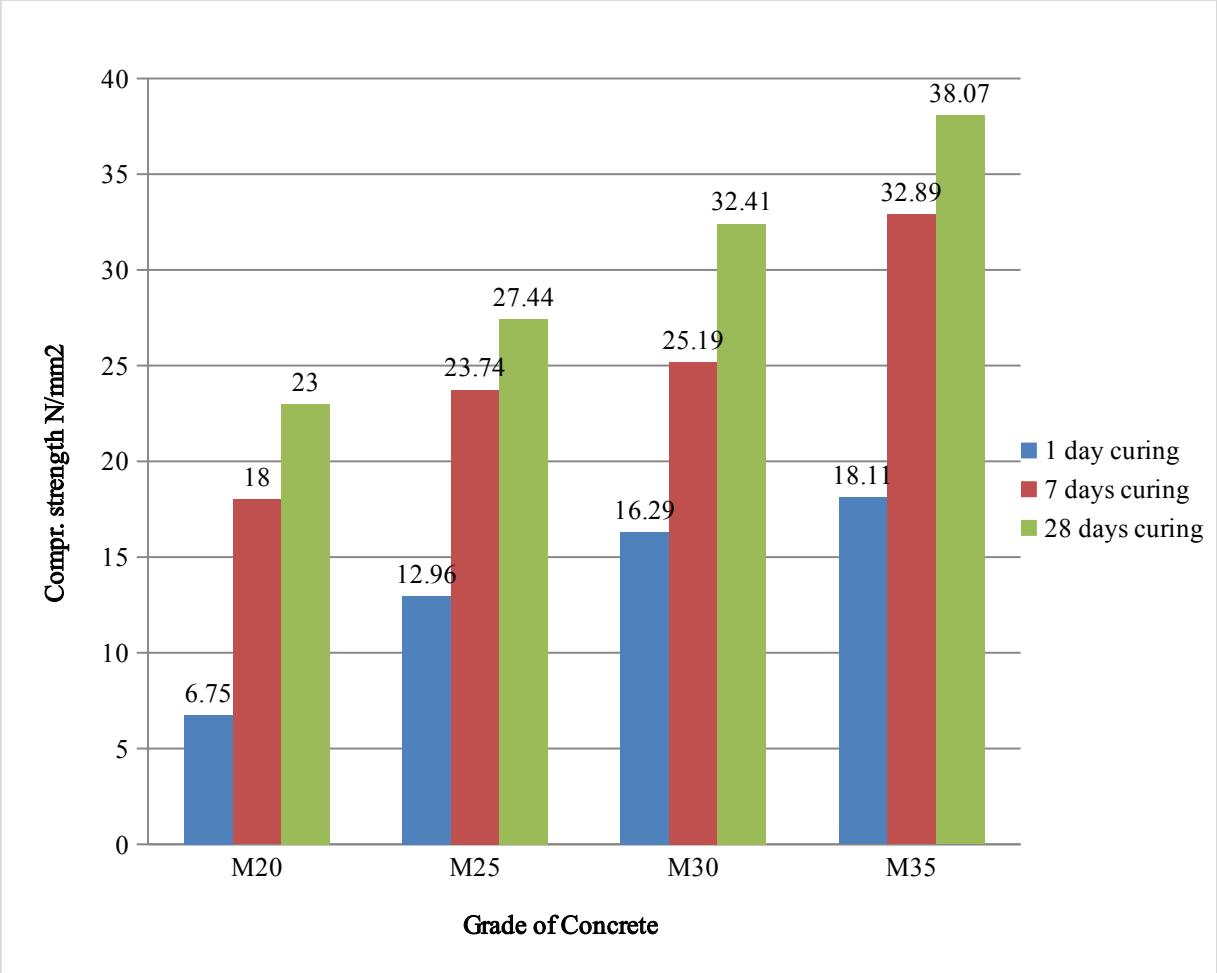
3 samples of each grade respectively were tested after curing period of about 27 days and tested on 28 day to compare them with the 7 days test result. The result are discussed in table 2.

Table 2: Compressive Test Result after 28 days

Sr. No.	Grade of Concrete	No. of Days of Curing	Compressive Strength (N/mm^2)
1	M_{20}	01	6.75
2	M_{20}	07	18
3	M_{20}	28	23
4	M_{25}	01	12.96
5	M_{25}	07	23.74
6	M_{25}	28	27.44
7	M_{30}	01	16.29
8	M_{30}	07	25.19
9	M_{30}	28	32.41
10	M_{35}	01	18.11

11	M_{35}	07	32.89
12	M_{35}	28	38.07

Figure 2: Variation of 28 Days Compressive Strength with Curing Period



4. Conclusion

It can be seen from the results obtained from the compressive strength of the samples that only day of curing is sufficient for the development of the compressive strength, although the strength increases with the increase in days of curing.

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