

# The Effect of Calcium Chloride on Flexural Strength of Concrete

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**Abstract**— In this paper we have discussed the effect of Calcium Chloride on the Flexural strength of concrete. Cement concrete prism of 700mm x 150mm x 150mm were cast using fresh water and calcium Chloride. The constant water cement ratio (w/c) was kept 0.45 by weight for all the mixes prepared. 15 prisms were casted for experiment. They were cured in fresh water. The curing was done for 7, 14, and 28 days, then crushed using the Flexural Strength Test Apparatus at prescribed ages. There was an increase in the Flexural strength of concrete for concrete specimens mixed and cured with calcium chloride.

**Key words:** Calcium Chloride, Pozzolana Portland Cement, Flexural strength

## I. INTRODUCTION

Fast cars, fast travel schedules, fast track construction has become the order of the day. In recent days, technology play an important role so these technological advancement has been an economic boon for the mankind. The main principle behind this advancement is 'time saved is money saved'. Since then engineers and administrators are making a every possible approach by making every part of construction to contribute into the system in making the construction faster. High Strength concrete is also one of them. The high strength concrete is about 35 years old. The high strength precast products and structural elements in beam were cast in situ using high strength concrete followed by the invention of water reducing admixtures in late 1960s.

But in today's scenario the industry has some very challenging demands for the cement manufacturers, admixture manufacturers. The high strength at early age is very much demanded by the users.

There are many aspects that increase the necessity of early age strength, but as engineers, we need to think about the durability aspects of the structures using these materials.

In this project I am going to add some chemical accelerator for the early age strength of concrete. Therefore I use Calcium chloride at various percentage of 0.4%, 0.8%, 1.2%, 1.6% by weight of cement. I have planned to prepare some numbers of prism and going to test them for its flexural strength at 7,14, 28 days.

The main objective is to determine the optimum content of calcium chloride for the early age strength of concrete and to analyze the behaviour of calcium chloride at various percentage for concrete at 7,14 and 28 days.

Therefore, we take mix design in the ratio of cement: water: fine aggregate: coarse aggregate: CaCl<sub>2</sub>= 1:0.45:1.72:2.9950:0.01

## II. MATERIALS USED

- 1) Pozzolana Portland Cement (Fly Ash based).
- 2) Fine aggregate.

- 3) Coarse aggregate.
- 4) Chemical Accelerator (Calcium Chloride).
- 5) Admixture(CICO plast super HS).
- 6) Water

### A. Test Data for Materials Used:

- |                                        |                                 |
|----------------------------------------|---------------------------------|
| - Cement Used                          | - PPC                           |
| - Specific gravity of cement           | - 2.98                          |
| - Specific gravity of Coarse aggregate | - 2.74                          |
| - Specific gravity of Fine aggregate   | - 2.64                          |
| - 75 – 100 mm                          | Workability                     |
| - Water absorption                     |                                 |
| - Coarse aggregate                     | - 0.30%                         |
| - Fine aggregate                       | - 0.32%                         |
| - Sieve analysis                       |                                 |
| - Coarse aggregate                     | - Confirms grading IS: 383-1970 |
| - Fine aggregate                       | - Confirms zone-II              |

## III. EXPERIMENTAL STUDIES

### A. Experimental Procedure

- 1) Selection of Mould: Since we have to check one strength parameters that is flexural strength. To measure flexural strength prism mould of dimensions 700x150x150 mm is used.
- 2) Casting of Specimen: To test the variation in flexural strength with the variation of Calcium Chloride content in design mix, three prismatic specimens each are made with Calcium Chloride contents 0.4%, 0.8%, 1.2%, 1.6%.

Then after, I have selected one of the above sample which give the optimum strength and cast the prism.

- 3) Sampling and Testing : Sample from fresh concrete shall be taken as per Indian standard code IS-2911 and sample shall be made, cured and tested at specified number of 7, 14 and 28 days.

The strength parameters are based to 28 days strength.

## IV. RESULTS AND DISCUSSIONS

It was observed that the strength increases at 7days. As the Percentage of Calcium Chloride Increases, Flexural strength also increases but after some limit if calcium chloride content increases then there is decrease in the rate of increase of flexural strength of concrete. In this experiment we got maximum strength of concrete on using 0.8% of Calcium Chloride by weight of cement. By using 1.2% of Calcium Chloride by weight of cement flexural strength increases but the rate of increase of flexural strength decreases as compared to 0.8% of Calcium Chloride used in same design mix.

The table and graphs representing this experiment are as follows:-

	Age (days)	Control concrete	Percentage Addition of calcium Chloride			
			0.4%	0.8%	1.2%	1.6%
Average Flexural Strength N/mm <sup>2</sup>	7	2.78	2.99	3.25	2.91	2.65
	14	3.42	3.59	3.68	3.46	3.34
	28	4.28	4.40	4.90	4.300	4.15

Table 1: Flexural Strength Of Concrete Using Calcium Chloride

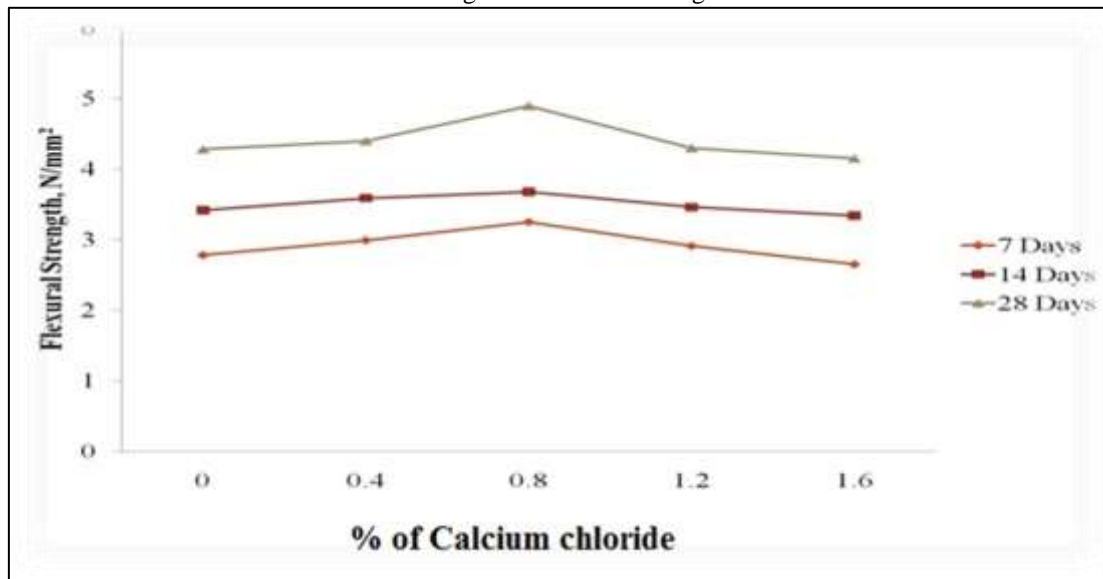


Fig. 2: Graph between flexural strength of Concrete wrt Calcium Chloride

## V. CONCLUSIONS

The following conclusions were made based on the findings of the study:

- 1) Flexural strength of concrete by using 0.8% of Calcium Chloride gives optimum strength to concrete at 7 days.
- 2) It shows that by using 0.8% of calcium chloride by weight of cement in design mix gives almost 80% of its target strength at 7 days, which becomes very helpful in faster constructions.
- 3) It was observed that the flexural strength of concrete using calcium Chloride is nearly equal to the strength of control prism at 28 days.

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