

## “EXPERIMENTAL STUDY ON EFFECT OF SUGAR POWDER ON STRENGTH OF CEMENT”

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### ABSTRACT

The present work deals with the results of experimental investigations on effect of sugar powder on setting time and compressive strength of cement and concrete. Effect of sugar on compressive strength of cement and concrete by using different brands of cement are studied. Sugar powder content is 0, 0.05, 0.075, 0.1, 0.15, and 0.2 % by weight of cement.

Cube of size 70 mm X 70 mm X 70 mm for compressive strength test of cement. And cube of size 150 mm X 150 mm X 150 mm for compressive strength test of concrete were cast. All the specimens were water cured and testing is done for 3 days, 7 days and 28 days. Results were observe and comparison of results of compressive strength of cement and concrete with sugar powder with that of normal cement and concrete showed the significant improvements in the results of compressive strength.

**KEYWORDS:** Sugar Powder (Retarding Agent), Compressive Strength, Different Types of Cement, Concrete

### INTRODUCTION

Plain concrete is a brittle material. Under impact and dynamic loading plain concrete exhibits extensive cracking and undergoes brittle failure. The concrete is weak in tension and hence to overcome this problem cement concrete is reinforced using steel bars and thus called as reinforced cement concrete (R.C.C.) In this modern age, civil engineering constructions have their own structural and durability requirements. Every structure has its own intended purpose and hence to meet this purpose, modification in traditional cement concrete has become mandatory.

If for any reason the concrete placement is stopped for longer than the initial setting time, the joint should be treated as a construction joint. Delay in concreting, resulting the cold joints and its affect concrete strength minor to very major strength reduction. The most important problem with cold joint is possibility of the moisture into the concrete section. And if this happened there is degradation of the concrete due to availability of the water in cold joint.

The objective of this study is to increase the mechanical properties of concrete in cold joint. Delays in concreting can result in cold joints. A cold joint is a plane of weakness in concrete caused by an interruption or delay in the concreting operations. It occurs when the first batch of concrete has begun to set before the next batch is added, so that the two batches do not intermix. A more serious problem associated with a cold joint is the possibility of moisture intrusion in to the concrete section. If water settles in a cold joint, it may lead to degradation of the concrete under certain environmental conditions. Hence avoiding this defect in cold joint some treatment is necessary. We can use retarding agents, use different types of fibers for to increasing the strength of cold joint. The main objective of the study is to find out the percentage of retarding agent sugar powder in hot weather for increasing the mechanical properties concrete in cold joint.

### A Retarding Admixture Causes Cement Set Retardation by the Following Mechanisms

- Adsorption of the retarding compound on the surface of cement particles, forming a protective skin, which slows down hydrolysis.
- Adsorption of the retarding compound onto nuclei of calcium hydroxide, poisoning their growth, which is essential for continued hydration of cement after the end of induction period.
- Formation of complexes with calcium ions in solution, increasing their solubility and discouraging the formation of the nuclei of calcium hydroxide.
- Precipitation around cement particles of insoluble derivatives of the retarding compounds formed by reaction with the highly alkaline aqueous solution, forming a protective skin

### METHODOLOGY

- Cements are taken of 53 grade ordinary Portland cement of different types of Company, named as Zuwari cement, Birla cement and Coromandal cement.
- The proportion of cement to sand is taken 1:3 as standard for measuring compressive strength of cement.
- Sugar powder content is 0%, 0.05%, 0.075%, 0.1%, 0.15%, 0.2% and 1% by weight of cement. Sugar becomes retarder at above 0.05percent of weight of cement, and below 0.05percent of cement become accelerator and, when touch at above 0.10 percent becomes again accelerator.

### RESULTS

- **Results of Initial & Final Setting Time of Cement:** It is taken by using vicat apparatus.

**Table 1: Initial & Final Setting Time of Different Types of Company Cement**

Sr. No.	% of Sugar	Initial Setting Time in Minutes			Final Setting Time in Minutes		
		Zuwari	Birla	Coro-Mandal	Zuwari	Birla	Coro-Mandal
1	0%	126	120	146	320	349	318
2	0.05%	183	179	210	394	410	436
3	0.08%	219	276	243	478	447	459
4	0.10%	321	345	313	587	593	633
5	0.15%	278	248	219	489	491	471
6	0.20%	197	174	163	309	316	326
7	1%	11	14	16	18	19	18

- **Cement Results**

**Table 2: Compressive Strength of Different Types of Company Cement**

Sr. No.	% of Sugar	28 Days (N/mm <sup>2</sup> )		
		Zuwari	Birla	Coro-Mandal
1	0%	50.43	47.18	49.89
2	0.05%	52.48	49.18	51.38
3	0.08%	52.18	53.97	54.83
4	0.10%	59.39	58.16	60.7
5	0.15%	54.18	55.6	58.63
6	0.20%	49.15	50.22	54.18

• **Concrete Results**

**Table 3: The Concrete Results for Mix Design 25 (M25)**

Sr. No.	% of Sugar	28 Days (N/mm <sup>2</sup> )		
		Zuwari	Birla	Coro-Mandal
1	0%	31.82	29.08	30.28
2	0.05%	32.12	31.35	30.71
3	0.08%	32.78	32.62	31.33
4	0.10%	34.84	33.77	33.89
5	0.15%	31.38	32.43	31.91
6	0.20%	29.45	30.13	30.18

**CONCLUSIONS**

- The amount of sugar powder 0.1% of the total weight of cement gives increased initial and final setting time.
- The amount of sugar powder 0.1% of the total weight of cement gives improved results in compressive strength.
- The compressive strength of cement & concrete is increased up to 15 -20%.
- By using sugar in concrete the workability of the mortar also increased.
- Thus it is beneficial when concrete pumping use for concreting, it is helpful because of its fluidity.
- The ill effect of time lag on compressive strength of concrete could be reduced by using sugar as a retarding agent.

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