

Impact of Sugar on Setting Time and Compression Strength of Concrete

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Abstract: *This project gives special importance or value to the effect of sugar on strength of concrete. This Project work determines the effect of admixtures (sugar) on the compressive strength of concrete block. Based on books and literature the main function of sugar is to increase the initial setting time of concrete. Usually, three different percentage of sugar admixtures are taken as 0.0, 0.06, and 0.08% by weight of cement. The compressive strength of concrete blocks increased by 16.02% at 28 days as compared to ordinary concrete blocks. The use of sugar is to delay setting of cement. But, addition of sugar has inevitable implications not only on setting time but also on compressive strength of cement paste. So, its effect needs to be well-understood for better control over its use. Test samples prepared by using 53 grades OPC cement and sugar in increasing proportion did not show a fixed result. On the other hand, use of slag cement considerably increased the compressive strength, tensile strength and the flexural strength of the concrete. Usually, three different percentage of slag cement was taken as 0%, 30% and 50%.the result showed that there was an increase of 20% increases in the compressive strength and a considerable increase in the tensile strength of the concrete mix.*

Keywords: Slag Cement, Sugar, Compressive Strength, Tensile Strength, Flexural Strength

I. INTRODUCTION

Most plain and reinforced concrete structures are designed on the principle that the effective concrete areas shall be stressed in compression only. Consequently, the compressive strength becomes the most important quality of the concrete and its accurate determination is the most outstanding problem for the engineering profession. Since, the first uses of concrete, attempts have been made to ascertain its compressive strength. However, the problem of interpreting and correlating the secured result is far more difficult than it appears to a casual inspector and the significance of the compressive test becomes a very difficult answer in definite terms. The compressive strength of concrete is one of the most important and useful properties of the concrete. In most structural applications concrete is employed primarily to resist compressive stresses. In those cases where strength in tension or in shear is of primary importance, the compressive strength is frequently used as a measure of these properties. Therefore, the concrete making properties of various ingredients of the mix are usually measured in terms of the compressive strength. Compressive strength is also used as a qualitative measure for the other properties of hardened concrete. No exact quantitative relationship between compressive strength and flexural strength, tensile strength, modulus of elasticity, wear resistance, fire resistance or permeability have been established nor are they likely to be. However, approximate and statically relationships, in some cases, have been established and these give much useful information to engineers. It should be emphasized that compressive strength gives only an approximate value of these properties and that other tests specifically designed to determine these properties should be useful if more precise results are required. For instance, the indicated compressive strength increases as the specimen size decreases, whereas the modulus of elasticity decreases. The modulus of elasticity in this case does not follow the compressive strength. The other case where the compressive strength does not indicate the useful property of concrete is when the concrete is subjected to freezing and thawing. Concrete containing about 6% of the entrained air which is relatively weaker in strength is found to be more durable than dense and strong concrete.

II. LITERATURE SURVEY

Al-Harhi, M. A., & AL Musallam, T. H. "Effect of sugar on setting and strength properties of concrete" This study investigates the influence of sugar on the setting time and compressive strength of concrete. The authors explore various sugar concentrations and their effects on both fresh and hardened properties of concrete. The research provides valuable data on the optimal dosage of sugar to achieve desired setting time retardation without compromising strength. Concrete made with admixtures like sugar can be utilized in particular situations. Usage of these admixtures will decrease the segregation and bleeding. The paper contents mix design of concrete by using sugar as admixtures and comparative study of workability and compressive strength of concrete with conventional concrete.

Marzouk, O. Y., & Helal, K. M. "Influence of sugar on strength and setting time of concrete" This paper examines the impact of sugar on the compressive strength and setting time of concrete mixtures. Experimental results reveal the effects of different sugar concentrations on hydration kinetics and microstructure development. The study offers insights into the mechanisms underlying sugar's influence on concrete properties. Construction activities are accomplished through laid down procedures and parameters such as temperature and humidity. Concreting in hot weather above 100°F accelerates the early hydration of cement and produce concrete with high strength at early ages but later, the strength is reduced considerably. The rapid evaporation of water causes plastic shrinkage in concrete and subsequent cooling cause tensile stresses and cracking. The study seeks to investigate the impact of sugar on setting - time of ordinary Portland cement (OPC) pastes and compressive strength of concrete.

Qasrawi, H. Y., & Asi, I. M. "Effect of sugar on the properties of fresh and hardened concrete" This research investigates the effects of sugar on both fresh and hardened properties of concrete. The study evaluates setting time, workability, and compressive strength for concrete mixes with varying sugar contents. It discusses the potential benefits and drawbacks of using sugar as an admixture and provides recommendations for practical applications. Concrete blocks are mostly used for covering or coating on a structure or material, load bearing purposes all around the world. This paper gives special importance or value to the effect of sugar on strength of concrete. This experiment determines the effect of admixtures (sugar) on the compressive strength of concrete block. Based on books and literature the main function of sugar is to increase the initial setting time of concrete. Concrete is most widely used manmade construction material in the world and obtain by mixing cement, sand, aggregates and water, and sometime admixtures is required in suitable proportions. The strength, durability and other characteristics of concrete depends up on the properties of its ingredients, on the proportion of mix, the method of compaction and other control during placing, compaction and curing. Concrete block has its superior properties like binding, strength and durability, but it cannot be used in all places due to different weather conditions in different countries.

III. AIM OF THE PROJECT

The aim of studying the impact of sugar on the setting time and compression strength of concrete is to investigate how the addition of sugar as an admixture affects these two critical properties of concrete.

IV. OUTCOMES

- To increase the compressive strength of the concrete.
- To increases the flexural strength and the tensile strength of the concrete structures.
- To make a cost efficient and more durable and workable concrete mix that can have a long life and strength as compared to a normal mix concrete.

V. CONCLUSION

The impact of sugar on setting time and compression strength of concrete has been thoroughly investigated through experimental studies and research findings. Sugar, when used as an admixture, offers both advantages and limitations in concrete production and construction practices. On one hand, sugar can effectively retard the setting time of concrete, providing flexibility in construction operations, especially in hot weather conditions or large-scale placements. By extending the setting time, sugar admixtures facilitate better workability and placement of concrete, reducing the risk of premature stiffening and ensuring uniformity in construction practices. Additionally, moderate doses of sugar have been shown to enhance early-age strength development, contributing to improved performance and durability of concrete

structures. However, the use of sugar as an admixture also presents certain limitations and challenges. Excessive dosages of sugar can lead to over-retardation and reduced long-term compression strength of concrete. Variability in environmental conditions, cement composition, and compatibility with other admixtures can further complicate the performance of sugar-modified concrete. Moreover, the cost-effectiveness and practical feasibility of using sugar admixtures must be carefully evaluated in the context of specific project requirements and budget constraints.

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