

USE OF SUGAR AS A RETARDING AGENT

1. roshan thapekar :- architthapekar2580@gmail.com.
2. Sameer porje :- Sameerporje1@gmail.com.
3. Sumit gaikwad :- sumeetgaikwad4126@gmail.com.
4. Piyush suryawanshi :- Suryawanshiyush19@gmail.com.
5. Ashok shelke :- ashokshelake4891@gmail.com.

Abstract:

Cement and concrete are the most important engineering materials in the construction industry. Atmospheric conditions play crucial roles on the properties of concrete. 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. To obtain the certain desired characteristics such as high compression strength, high workability, high performance and durability parameters, admixtures are used like fly-ash, blast-furnace slag and silica fume etc. The use of chemical admixture produces pollution. Increase in pollution and heat of hydration may cause harmful effect to environment. The market rate of these admixtures is more. So, we replaced pollution causing chemical admixtures by environment friendly admixture i.e., Sugar. Sugar is used as retardants to slow down the setting of concrete, particularly in warm weather. In the case of sugar, the setting process is slowed down because it interferes with the chemical reaction that causes cement to set when water is added. The use of sugar to delay the setting of cement at the construction site is cheap and readily available. The proposed work determines the effects of sugar on the setting time of cement and compressive strength of concrete.

Keywords - OPC-ordinary Portland cement, admixtures, sugar, setting time and compression strength, workability

INTRODUCTION

Concrete is a mixture of coarse aggregates (CA), fine aggregates (FA), concrete and water in appropriate proportion. Initial setting time of concrete is necessary to delay the hydration process and hardening as well as final setting time helps to remove shuttering or formwork safely. Sometimes concreting is done in hot weather i.e., above 100°F may accelerates the early hydration of cement and produce concrete having high strength at early ages, but later the strength is reduced considerably. Further, the rapid evaporation of water causes plastic shrinkage in concrete and subsequent cooling would cause tensile stresses and cracking. Hence in order to maintain the standard condition, admixtures are used. The strength, durability and other

characteristics of concrete depends up on the properties of its ingredients, on the proportion of mix, 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. Variation in weather condition and seasons causes changes in the initial setting time of concrete. A delay in the setting of cement paste can be achieved by adding a retarder to the concrete mix. Retarders generally slow down the hardening of the cement paste by stopping the rapid set shown by tricalcium aluminate but do not alter the composition of hydration products. The delay in setting of the cement paste can be exploited to produce architectural finish of exposed coarse aggregates. Retarders can be useful when concreting in hot weather, when the normal setting time of concrete is shortened by the higher ambient temperature. Sugar is a carbohydrate, a substance

composed of carbon, oxygen and hydrogen. It can be useful when concrete used in hot weather, when the normal setting time of concrete is shortened by the higher surrounding temperature. Sugar delays the setting time of cement by up to 1.33 hours at dosage level of 0.06% by weight of cement. No effect on workability, compaction by the use of sugar as admixture in concrete. Higher long-term compressive strength can be achieved in concrete by the use of sugar as admixture. Sugar is already extensively used in the handling of concrete – normally as one component of a chemical retarder added when it is being mixed. The sugar slows down the setting of the concrete, and is used in hot conditions or when large amounts of concrete must be poured out before setting occurs. Sugar is used as a retarder for a concrete mix. reputable procedure. slows the hardening of the minerals.

Objectives:

- To study the change in setting time of concrete by adding sugar.
- Replacing chemical retarders by natural Sugar.
- To study the effect of sugar on compressive strength of concrete.
- To promote sugar as an optimum retarder.

The compressive strength of cubes gives us the information of the potential strength of the concrete mix from which it is sampled. It helps in determining whether correct mix proportions of various mix proportions of various materials were used to get the desired strength.

Adjust the Setting Time of Cement Which Product Is Added in Cement During Manufacturing.

Gypsum is added to control the “setting of cement”. If not added, the cement will set

immediately after mixing of water leaving no time for concrete placing.

Setting Time of Cement Increases by Adding sugar.

Setting time of cement decreases by adding Calcium Chloride. by adding calcium chloride decrease the setting time of cement or shortens the time wasted at the well site as operators wait for cement properties to take hold.

Sugar delays the setting time of cement by up to 1.33 hours at dosage level of 0.06% by weight of cement. No effect on workability, compaction by the use of sugar as admixture in concrete.

Surface retarders are spray-applied, water-soluble products designed to slow the set of surface mortar in concrete to expose the aggregate. These products temporarily halt the set of Portland cement at the surface while the concrete below the surface cures normally.



Methodology:

Fig .1: Flow Chart – Methodology

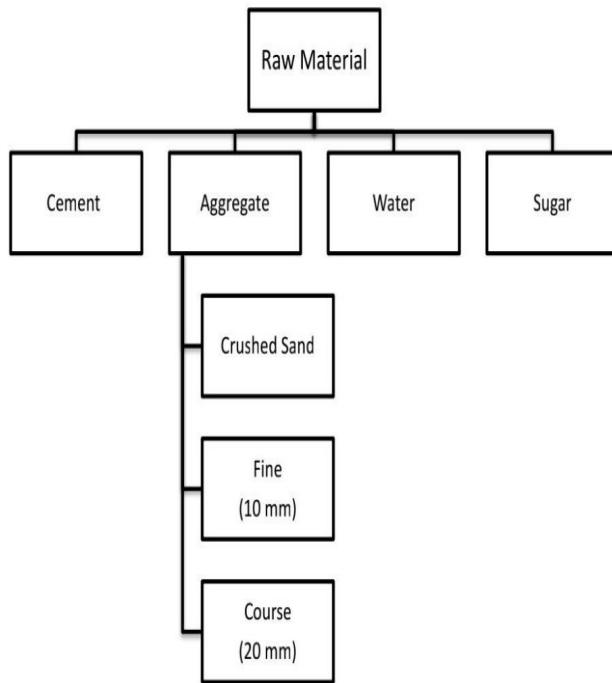


Fig .2: Flow Chart showing materials used for cube casting by adding different percentages of sugar in concrete

Experimental Setup

In order to compare the initial setting time, final setting time of concrete and compressive strength of concrete after adding sugar into the concrete, different percentages of sugar admixtures were used such as 1 and 1.2% by weight of concrete. Mixed design adopted for experimental work was 1:1:2 (M25).

Procedure to follow:

To achieve the desired objectives in this work OPC 53 grade concrete sample was taken. To perform the test on cubes, sugar is used to perform the experiment. Sugar was dissolved in required amount and then adding this solution of sugar into concrete by desired proportion of concrete. In order to determine the Consistency and setting time of concrete paste vicat apparatus, conforming to IS: 5513-1976, was used. The test was performed conforming to IS. The standard consistency of a concrete paste was

recorded as amount of water added that permits 5 to 7 mm penetration of vicat plunger from the bottom of the vice mould (IS:4031(Part 4)1988). Similarly setting time was measured as per IS:4031(Part 5),1988- initial setting time as the period elapsed between the time of adding water to the concrete to the time when needle fails to pierce the mould by 5±0.5mm; final setting time as period elapsed between the time of adding water to the concrete to the time when the annular ring fails to make the impression on the mould as the final setting time. Compression test were taken on samples of concrete prepared by desired proportion of concrete.

TEST TO BE PERFORM :

- 1 .Fineness test:
- 2 .Specific gravity:
- 3 .Standard consistency test:
- 4 .Testing for initial setting time:
- 5 .Water Absorption Test:
- 6 .Fineness Modulus Test
- 7 .Testing for compressive strength on cube.

CONCLUSION:

Retarder and Accelerator are used to increase and decrease the initial setting time of concrete especially in winter sessions and summer sessions respectively. With the help of different type of admixture used such as Retarder sugar and gypsum etc. and Accelerator calcium chloride (cacl2) etc. By going through studying to various review papers and research papers sugar is good admixture to increasing the initial setting time. Sugar is a carbohydrate, a composition of carbon, oxygen and hydrogen. It can be useful when concreting used in hot weather conditions, when the normal setting time of concrete is shortened by the higher surrounding temperature such as Gujarat, Rajasthan states etc. Very small dosage of the order of 0.05 to 0.1 per cent of the mass of the concrete is enough. 0.05 per cent of sugar can delay initial setting time by about 3 hours. Usually three different percentage of sugar admixtures were taken as by weight of cement.

REFERENCES

- 1) AK.Azad,etal (2020) "Effects of sugar on concrete and compressive strength of concrete," Proceedings of ind International Conference on Research and Innovation in Civil Engg.(ICRICE 2020) Paper ID:/31.
- 2) Abhijeet Kawade,et.al (2017) "Experimental study of Effects of sugar on properties of concrete." , Journal of structure and transportation studies, (JSATSJ, Vol 2, Issue -1.
- 3) Arpana,Keerthi Gowda et.al (2017) "Effect of sugar on setting time and compressive strength of concrete." Manglore institute of technology and engg. Moodbidri INDIA, ISBN:978-93-5267-355-1, (ICGCSCJ, 2017.
- 4) Rajendra, L. D. et.al (2017). "Experimental study on strength characteristics of cement concrete by adding sugar waste", International Journal of Engineering Sciences & Management, 7(1):33-40.
- 5) Usman N.D, et.al (2016) "The Impact of sugar on setting time of OPC and compressive strength of concrete," FUTY Journal of the Enviomment(FUTYJE) Vol.JO No. 1 Nov, 2016.
- 6) Aftab, A et.al. (2016) "Experimental study on strength characteristics of cement concrete by adding sugar waste," International Journal of Enhanced Research in Science, Technology & Engineering (IJERSTE) 5(7):33-40
- 7) Jaibeer chand, et.al (2015) "Effects of sugar on compressive strength of concrete," International Journal of Advanced Technology and Engg. Research (IJATER), Vol.5 Issue 4, July 2015.
- 8) Suryawanshi, Y. R et.al (2014). "Experimental study on effect of sugar powder on strength of cement", International Journal of Research in Engineering & Technology, (IJET) 2(4):249-252
- 9) Gnaneswar. K (2013), "Effect of Sugar and Jaggery on strength Properties of Concrete," The International Journal of Engineering and Science (/JES), Volume 2, Issue 10, Pages 01-06, 2013
- 10) Giridhar V (2013), "Effect of Sugar and Jaggery on Strength Properties of Concrete,"The International Journal of Engineering and Science (!JES), Vol.2, Issue 10 1, June 2013.
- 11) Akogu Elijah Abalaka, (2011) Effects of sugar on properties of OPC and concrete. AU J.T. 14(3);225-228(Jan.2011)
- 12) Jwnadurdiyev, A et.al (2005). "The utilization of beet molasses as a retarding and water-reducing admixture for concrete," Cement and Concrete Research 35(5): 874-82, May
- 13) Khan Bazid et.al (2004) "Effect of a Retarding Admixture on the setting time of Cement Paste in Hot Weather," JKAU: Eng. Sci., vol. 15 no. 1, pp. 63-79
- 14) BSI. (2003). BS E 12390-2. "Testing hardened concrete. Part making and curing specimens for strength tests," British Standards Institution, London, UK
- 15) Garci Juenger, MC et.al (2002) 'ew insights into the effects of sugar on the hydration and microstructure of cement pastes," Cement and Concrete Research 32(3): 393-9, March
- 16) Neville AM (1995) "Properties of Concrete," (2nd. ED), Longman Group Limited.
- 17) Lea, F.M. (1988). "The chemistry of cement and concrete," 3rd ed., Edward Arnold, London, UK
- 18) EN 196-3 (1987). "Methods of testing cement," Part 3: Determination of setting time and soundness. European Standard, European Committee for Standardization, Brussels,Belgium.
- 19) BSI (1997). BS (1881). Part 111 "Methods of normal curmg of test specimens," (20oC method) British Standards Institution, London, UK.
- 20) B I (1996) BS (1881) Part 108 "Method for making test cubes for fresh concrete," British Standards Institution, London, UK.