

SUGAR IN PORTLAND CEMENT MORTAR AND CONCRETE

A report issued by Mellon Institute of Industrial Research, Pittsburgh, Pa., on effect of sugar in mortar showed that strength of mortar was increased by the addition of sugar. Syndicated articles on this report did not state clearly that the mortar referred to was lime mortar, *not portland cement mortar*.

Sugar Detrimental to Portland Cement Mixtures

Sugar is one of the most detrimental substances that can be introduced in a mixture containing portland cement. Accompanying test results show very small quantities of sugar may prevent portland cement mixtures from attaining their potential strength. Specimens containing small quantities of sugar and placed in water or a damp atmosphere split and disintegrate in a few days.

The small quantity of sugar in old sugar sacks, when sand has been shipped in them for tests, has been sufficient to greatly reduce the strength of mortar specimens and sometimes cause disruption. Washing such sacks must be thorough to render them satisfactory for shipping sands for tests. It is better not to use them.

Failures of concrete have been reported due to the introduction of sugar into the mix by shipping sand in cars previously used for sugar. One case is reported where wood for form work had been stored in a sugar warehouse and, although the wood was carefully washed, a layer of concrete from $\frac{1}{2}$ to $\frac{3}{4}$ -in. could be removed easily from the wall surface.

Not Harmful to Hardened Concrete

Dry sugar has no effect on hardened concrete. Concrete subject to repeated wetting and drying

with sugar solutions should have low absorption and a surface treatment of magnesium fluosilicate, sodium silicate or boiled linseed oil is advisable.

Results of tests to determine the effect of sugar in 1:3 mortar, made at Lewis Institute, are given in the following table.

EFFECT OF SUGAR ON STRENGTH OF PORTLAND CEMENT-SAND MORTAR

1:3 portland cement-sand mortar—sand from Elgin, Ill. Specimens tested at 7 days had been stored 1 day in moist air and 6 days in water. Those tested at 28 days had been stored in moist air.

Sugar % by wt. of Sand	Water % by wt. of Cement	Compressive Strength 2x4 Cylinders lb. per sq. in.		Tensile Strength Briquets lb. per sq. in.	
		7 days	28 days	7 days	28 days
0.0	43.6	2,000	3,090	370	808
0.05	43.6	Nearly all	4,020	Nearly all	...
0.1	43.6	specimens	2,830	specimens	...
0.2	43.6	disintegrated in water	220	disintegrated in water	85
0.5	43.6		110		50
1.0	43.6		170		*
2.0	43.6		110		*

* Specimens broke under weight of jaws of machine.

Other investigations reported in *Concrete* for April, 1923 and January, 1928 and in *Ceramic Abstracts* for November, 1924 corroborate these results.

If there is any doubt as to whether sugar is present in concrete materials, they should be checked or a test made in a properly equipped laboratory by men skilled in such work.

A test to determine presence of sugar in sand is described by N. H. Roy, University of Illinois, in the *Proceedings of the American Society for Testing Materials*, Volume 29, Part 2, 1929.

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