

Review of Codal Provisions for Sampling of Fresh Concrete

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Abstract: Standard procedures for testing are required for generalizing results and to maintain uniform quality policies. In practice, there is often a tendency to mix concrete as rapidly as possible; to place it as rapidly as possible; which results in negligence to proper compliance with necessary quality checks. It is therefore important to know the necessary sampling techniques in order to collect a true representative sample and to produce a concrete of uniform composition and reliable strength. The sampling methods used for sampling freshly mixed concrete by Indian and American have been reviewed and compared in this paper.

Keywords: Fresh concrete, Sampling techniques, Batch, Composite sample.

I. INTRODUCTION

From a practical point of view, in civil engineering standard procedures for testing are required in order to generalize the results and adopt uniform quality policies. Although standard testing procedures are adopted by different countries to evaluate the quality of fresh concrete, the specifications used to collect samples for test govern the reliability and adequacy. Generally the sampling accuracy is assured by a limit on the average range of pairs, and if two samples in a pair differ unduly then their results have to be discarded. The basic method of verifying the quality of concrete and that whether it complies with the specification is to test its strength using cubes or

cylinders made from samples of fresh concrete. In principle, it is preferable to devise compliance tests mix proportions of fresh concrete even before it has been placed but, unfortunately, such tests are rather complex and not suitable for site work. Consequently, the strength amount of hardened concrete has to be determined by which time a considerable amount of suspect concrete may have been placed (Neville and Brooks 2007).

The properties of concrete can be determined only by testing, and testing itself introduces error. It is important to realize this and to understand that the test results depend on the sampling techniques.

The values of test results repeatability and reproducibility are primarily applied:

- (a) to verify that the experimental technique of a laboratory is up to requirement;
- (b) to compare the results of tests performed on a sample from a batch of material with the specification;
- (c) to compare test results obtained by a supplier and by a consumer on the same batch of material.

This paper is an attempt to compare the sampling methods used for sampling freshly mixed concrete specified by Indian and American standards. The parameters described for sampling have been discussed in the following sections.

A. Time

ASTM C172 specifies that the elapsed time shall not exceed 15 minutes between obtaining the first

and final portions of the composite sample. Samples for tests on fresh concrete such as checking slump, temperature, and air content should be taken within 5 min after obtaining the final portion of the composite sample. Samples for strength tests should be taken within 15 min. after fabricating the composite sample.

However the Indian Standards 1199-1959 does not specify that duration of time. The code has specified that the sample shall be taken when a batch of concrete is being mixed or immediately after the discharge of concrete on the site.

B. Size of Sample

As per ASTM C172, the sample size for strength tests should be a minimum of 0.028 m^3 . Smaller samples are permitted for testing routine air content, temperature, and slump tests. Two or more portion of sample should be collected from uniformly spaced intervals during discharge of the middle portion of the batch within the specified time. ASTM proscribes samples from the first and last part of the batch.

As per Indian Standards (IS 1199-1959), the composite sample shall not be less than 0.02 m^3 . It is specified that the sample shall be collected from not less than five well distributed positions.

C. Procedure of sampling from of mixer

ASTM specifies that the concrete sample from paving mixer should be taken from at least five different portions of the pile and then composite into one sample for test purposes. The sample of concrete taken from paving mixer should be collected by placing three shallow containers on the sub grade and discharging the concrete across the container to prevent contamination or absorption by the sub grade. All the three samples shall then be combined for testing. From stationary/revolving mixer the concrete should be sampled by collecting two or more portions taken at regularly spaced intervals during discharge of the middle portion of the batch.

According to Indian Standards, the concrete should be taken during mixing or immediately after the discharge of concrete on the site. The sample should be taken when one-quarter, one-half and three-quarter of the concrete have been discharged from the mixer. If more than three samples are

required to be taken, then, the samples should be taken from shorter and equally spaced intervals. Further, each sample should be collected by passing a clean container across the stream of the concrete. This container shall be constructed of non-absorbant material and shall be such that the sample retained in not segregated.

D. Procedure for Large Maximum Size Aggregate Concrete

The ASTM has specified the procedure of wet sieving for concrete containing aggregate larger than the size of molds/equipment to be used. The effect of wet-sieving on the test results should also be considered. The wet-sieving of concrete causes some loss of air due to additional handling. It has been observed that usually, the apparent strength of wet-sieved concrete in smaller specimens is greater than that of the total concrete in larger appropriate size specimens. Therefore, the effect of these differences should be considered. On the contrary, the Indian Standard has not recommended the procedure of wet-sieving/other to deal with large size aggregates in concrete.

II. COMPARISON OF THE PRECAUTIONS REQUIRED

- 1) According to ASTM, sampling should be performed by passing a container completely through the discharge stream, or by completely diverting the discharge into a sample container. The concrete should be discharged into a container or transportation unit sufficiently large to accommodate the entire batch in order to take samples, in case the discharge is too fast to divert the complete discharge stream. However, Indian standards have not specified discharge/handling of concrete from a batch.
- 2) The ASTM specifies that the flow of concrete from the mixer, container, or transportation unit should be carefully restricted so as to cause segregation. However, Indian standards have not laid

specifications for regulating the flow of concrete.

- 3) The ASTM specifies that samples should not be taken before 10% or after 90% of the batch has been discharged. The Indian Standard has specified that samples should be taken when 25%, 50%, and 75% of the concrete have been discharged from the mixer.
- 4) According to ASTM, the size of container used to collect sample should be sufficient to provide a composite sample size that is in agreement with the maximum aggregate size. The containers should be supported above the sub grade to prevent displacement during discharge wherever required. The Indian Standard has specified that the container should be clean and constructed of non-absorbant material, preferable of metal, and shall be such that the sample retained in not segregated.
- 5) According to the Indian standard, the sample should be combining by mixing with non-absorbant base either with a shovel or by other suitable implement in such a manner as to ensure uniformity.
- 6) The Indian standard specifies that the sample should be protected against weather; however, the ASTM has not specified the care to be taken against weather.

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