

Technology in Practice

What, Why & How?



TIP 3 - Aggregate Sampling for Laboratory Tests

This TIP serves to improve the understanding of obtaining representative aggregate samples

WHAT is Aggregate Sampling?

Aggregates constitute about 70% of the concrete volume. Certain aggregate properties such as aggregate relative density (specific gravity), bulk dry density (dry rodded unit weight), fineness modulus of sand, absorption, and moisture content are essential for concrete mixture proportioning and to establish batch weights. While some of these characteristics are reported by the aggregate supplier, the concrete producer will periodically need to test aggregates at the plant as part of their quality control activities to optimize concrete mixtures. Producers sample aggregates for moisture measurements on a daily basis or less frequently to calibrate automated moisture probes. Samples may also be required on a regular basis for other tests such as sieve analysis, or for prequalification tests as required in project specifications. It should be understood that any movement and handling of aggregate will result in some change in its grading and possibly other properties.

At a ready mixed concrete plant aggregates are typically stored in a bin or a stockpile. The process of taking a sample of aggregate that is truly representative of the nature and condition of the aggregate in the stockpile, bin or transfer point is called aggregate sampling. ASTM D75 is the standard practice for sampling aggregates. The size of the sample obtained in the field is rather large to ensure that it is representative. The test portion required for aggregate tests or for concrete trial batches may be relatively small and extracted from a reduced sized portion of the field sample in accordance with ASTM C702 – See TIP 4.

WHY is Aggregate Sampling Important?

The goal of obtaining a sample is to obtain an unbiased estimate of the characteristic of interest—some tested property—of the larger universe of the material. Often this universe is defined as a lot. Variation exists with the material as a whole and also within a lot. To ensure that the sample is *representative* of the lot, every portion of the lot should have an equal chance (probability) of being selected as the sample. This is accomplished by following a random sampling procedure. Random sampling is sometimes modified to ensure that a better representative sample is obtained by avoiding some portions of the lot.

By following ASTM D75 an aggregate sample that is representative of the aggregate in its stored condition can be obtained for aggregate testing. Obtaining a representative sample is critical when performing aggregate tests. A sampling process that results in a sample that is not representative will produce biased test results and likely cause other errors in producing concrete.

The purpose for which aggregates are sampled impacts the process and care required when sampling aggregates. The purpose for obtaining samples also establishes the procedure, frequency and size of the sample required. Aggregate samples might be obtained for source evaluation or aggregate production control, ensuring the material as ordered is received, for acceptance or rejection decisions, or for quality control of concrete.

Statistical concepts should also be considered when sampling. The greater the variation of the material or lower the precision of the test method, the more samples and tests are needed to make statistically valid decisions on the measured properties.