



Concrete Testing Part I: Slump Test

Tech Letter
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Introduction

This Tech Letter is the first in a series covering the proper methods for testing the quality of ready mixed concrete. All information is based on standards and procedures provided by the American Society for Testing and Materials (ASTM). These standards can be found in detail in the 1982 Annual Book of Standards Part 14 - "Concrete and Mineral Aggregates." ASTM standards have become the most widely accepted set of construction guidelines in the world today. This is due to the fact that more than 130 technical committees are continuously studying and evaluating the results of over 17,000 technical experts' day to day laboratory and field tests. An ASTM standard is subject to revision at any time by the responsible technical committee and these revisions are presented annually in the "Annual Book of ASTM Standards."

This series of Tech Letters is only a summary of proper testing procedures and is not a word for word transcript of ASTM Standards. This outline is presented with the intention of helping improve the quality of concrete testing in this construction market. It is only a set of guidelines that we feel could help reduce the chances of invalid test results.

The topics to be covered in this series are:

1. Slump Test
2. Compressive Strength Test
3. Air Content and Yield



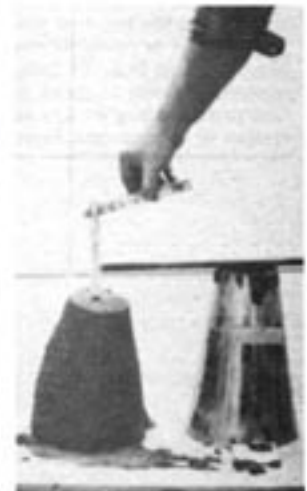
1. Filling the cone



2. Rodding sample



3. Removing the cone



4. Determining slump

SAMPLING FRESHLY MIXED CONCRETE ASTM C-172

Before any of the previously mentioned tests can be performed, a representative sample of the fresh concrete must be obtained. The proper methods of collecting such samples is covered in ASTM C-172. This designation explains the correct methods of acquiring samples

from agitating and nonagitating equipment used to transport central-mixed concrete. It also includes sampling from stationary, paving, and truck mixers. We will only cover the samples taken from standard ready-mixed concrete trucks since this is the most common type of testing in this construction market.

SAMPLING

Concrete samples should be taken directly from the ready-mix trucks' discharge system and shall be taken out of the middle portion of the load. In any case, do not obtain samples until after all of the water has been added to the load; also, do not obtain samples from the very first or last portions of the batch.

The elapsed time between obtaining the sample and initiating the testing should not exceed 5 minutes for slump and air content tests and 15 minutes for strength tests. It is best to transport the concrete sample to the place where the tests will be made and it should be combined and remixed with a shovel or scoop in order to offset any segregation that may have occurred during movement. All tools including shovels, scoops, tamping rod, cylinder molds, slump cone, and wheelbarrows should be rinsed with clean water and drained thoroughly just prior to each test. All tests should be performed on a level, rigid, horizontal surface free from vibration and as near as possible to the location where they will be stored during the first 24 hours.

TEST for SLUMP of PORTLAND CEMENT CONCRETE ASTM C-143

The consistency and uniformity of fresh concrete is described by the term "slump." The slump of a given sample of ready-mixed concrete is measured in inches and is determined by means of the universally accepted testing procedure described by ASTM designation C-143.

TOOLS and EQUIPMENT

Slump tests shall be performed by placing the fresh concrete into a metal mold in the shape of a cone. This slump cone shall be 8 inches in diameter at the bottom, 4 inches in diameter at the top, 12 inches in height, and open at both ends. The mold shall be provided with foot pieces and handles, and tests should be performed on a flat, rigid, nonabsorbent surface. The tamping rod used to consolidate the sample shall be a round, straight steel rod 5 1/8 inches in diameter and approximately 24 inches in length with at least one end rounded to a blunt tip (see photo).

PROCEDURE

Dampen all tools and equipment and place the slump cone on the designated testing surface. The cone should be held firmly in place during filling by the operator standing on the two foot pieces (see photo 1). By using a small shovel or scoop fill the cone 1/3 full by volume (about 2 1/2" up from the bottom of cone) with fresh concrete and rod 25 times with specified tamping rod. Distribute rodding strokes evenly over the entire cross section of the concrete. Each stroke should penetrate the entire depth of this first layer (see photo 2). Immediately fill the cone another 1/3 by volume (to about half the height) and again rod 25 times. The rod should be allowed to pass through this second layer of concrete and penetrate about 1/2 inch into the underlying

layer. Finally, fill the cone to overflowing and again rod 25 times following the previous procedure. Strike off excess concrete from the top of the cone by means of a screeding motion of the tamping rod. After cleaning the overflow away from the base of the mold, remove the mold by raising it carefully in a vertical direction. The removal process should be performed in 5 ± 2 seconds by a steady

upward lift being careful not to twist the cone or move it in a lateral direction (see photo 3). Complete the entire test from the start of the filling through the removal of the mold without interruption and within an elapsed time of 2½ minutes.

It is now time to determine the slump of the concrete. This is done by simply placing the tamping rod horizontally across the inverted mold so the rod extends over the slumped concrete. Immediately measure the distance from the bottom of the rod to the original center of the top of the specimen. This distance to the nearest ¼ inch is the slump of the concrete (see photo 4).

CONCLUSION

The standard slump test is very simple and can be performed with great accuracy if the ASTM guidelines are followed. The two things that contribute most to an invalid test are improper rodding and carelessness in removing the mold. A lack of rodding may cause poor compaction and over rodding could bring about segregation. Both lead to invalid results. Removing the cone is also very critical and a sudden twist or jerk can greatly reduce the accuracy of the results. It is also very important that the base on which the slump test is being taken is level and free from even the slightest vibration. Movement will very likely indicate a greater slump than is actually being used. Finally, do not use a piece of rebar or any steel rod with a square end to tamp the sample. This may force the large aggregate to the bottom of the cone and cause the test to be invalid. As with any type of quality assurance testing, the people who perform the tests should be well aware of the proper procedures to be followed and that if specific standards are not met

the test results may prove to be invalid. This will consequently result in a loss of valuable time and may result in the need for more expensive testing.