ASTM Testing Methods

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Connections between Specifications

Materials
- C33 Agg.
- C1602 Water
- C150 Cement
- C618 Ash
- C290 Air
- C494 Admix

Material
- C49 Ready-Mix

Sampling
- C172 Sampling Fresh Concrete

Testing
- C39 Strength
- C231 Air
- C143 Slump
- C1064 Temp
Overview

- Sampling

- Discrete Test Methods
  - Temperature (C1064)
  - Density (C138)
  - Air Content (C231)
  - Slump (C143)
  - Strength (C39)
1.1 This practice covers procedures for obtaining representative samples of fresh concrete as delivered to the project site on which tests are to be performed to determine compliance with quality requirements of the specifications under which the concrete is furnished (Note 1).

NOTE 1—Composite samples are required by this practice, unless specifically excepted by procedures governing the tests to be performed such as tests to determine uniformity of consistency and mixer efficiency. Procedures used to select the specific test batches are not described in this practice, but it is recommended that random sampling be used to determine overall specification compliance.
5.2.3 Sampling from Revolving Drum Truck Mixers or Agitators—Sample the concrete by collecting two or more portions taken at regularly spaced intervals during discharge of the middle portion of the batch. Take the samples so obtained within the time limit specified in Section 4 (15 min) and combine them into one composite sample for test purposes. In any case do not obtain samples until after all of the water and any admixtures have been added to the mixer; also do not obtain samples from the very first or last portions of the batch discharge (Note 3).

**NOTE 3**—No samples should be taken before 10% or after 90% of the batch has been discharged. Due to the difficulty of determining the actual quantity of concrete discharged, the intent is to provide samples that are representative of widely separated portions, but not the beginning and the end of the load.
6.1 It is acceptable to measure the temperature of freshly mixed concrete in either the transporting equipment or the forms after discharge provided the sensor of the temperature measuring device has at least 75 mm [3 in.] of concrete cover in all directions.

7.2 Leave the temperature measuring device in the freshly mixed concrete for at least 2 min but not more than 5 min, then read and record the temperature to the nearest 0.5 °C [1 °F]. Do not remove the device from the concrete when reading the temperature.
Density of Concrete (C138)

- Three results:
  - Density (Unit weight)
  - Theoretical density
  - Yield
  - Relative yield
    - Relative yield is the ratio of the actual volume of concrete obtained to the volume as designed for the batch
Air Content (C231) or (C173)

- Pressure method (C231) or Volumetric (C173)
- Test for volume of air content
  - No bubble spacing or bubble size
- Reporting to the nearest 0.1%
  - Minus the aggregate correction factor
4.1 This test method is intended to provide the user with a procedure to determine slump of plastic hydraulic-cement concretes.

**Note 1**—This test method was *originally developed* to provide a technique to monitor the *consistency* of unhardened concrete. **Under laboratory conditions,** with strict control of all concrete materials, the slump is generally found to increase proportionally with the water content of a given concrete mixture, and thus to be inversely related to concrete strength. **Under field conditions,** however, **such a strength relationship is not clearly and consistently shown.** Care should therefore be taken in relating slump results obtained under field conditions to strength.
C143 Slump (Practically)

- Measure of concrete vertical drop under its own self weight.
- Results do NOT calculate:
  - Water content
  - Strength
  - Cementitious content
C143 Slump
C143 Slump
C143 Slump

- Is a practical measurement of fresh concrete consistency.
- Avoid the trap of use as a predictive tool.
- Slump is a contracting issue not a design/engineering issue
8. **Slump, Air Content, and Temperature**

8.1 **Slump**—Measure and record the slump of each batch of concrete from which specimens are made immediately after remixing in the receptacle, (C143/C143M).

8.2 **Air Content**—Determine and record the air content in accordance with either Test Method C173/C173M or Test Method C231. The concrete used in performing the air content test shall not be used in fabricating test specimens.

8.3 **Temperature**—Determine and record the temperature in accordance with Test Method C1064/C1064M.
10.1.2 Initial Curing—Immediately after molding and finishing, the specimens shall be stored for a period up to 48 h in a temperature range from 60 and 80 °F [16 and 27 °C] and in an environment preventing moisture loss from the specimens. For concrete mixtures with a specified strength of 6000 psi [40 MPa] or greater, the initial curing temperature shall be between 68 and 78 °F [20 and 26 °C].
Importance of proper curing
Questionable result?
Questionable result?
Questionable result?
1.1 This test method covers determination of compressive strength of cylindrical concrete specimens such as molded cylinders and drilled cores. It is limited to concrete having a density in excess of 800 kg/m$^3$ [50 lb/ft$^3$].

4.1 Care must be exercised in the interpretation of the significance of compressive strength determinations by this test method since strength is not a fundamental or intrinsic property of concrete made from given materials. Values obtained will depend on the size and shape of the specimen, batching, mixing procedures, the methods of sampling, molding, and fabrication and the age, temperature, and moisture conditions during curing.
4.2 This test method is used to determine compressive strength of cylindrical specimens prepared and cured in accordance with Practices C31/C31M, C192/C192M, C617, and C1231/C1231M and Test Methods C42/C42M and C873.

4.3 The results of this test method are used as a basis for quality control of concrete proportioning, mixing, and placing operations; determination of compliance with specifications; control for evaluating effectiveness of admixtures; and similar uses.
9.1 Report the following information:

9.1.1 Identification number,
9.1.2 Average measured diameter (and measured length, if outside the range of 1.8 $D$ to 2.2 $D$), in millimetres [inches],
9.1.3 Cross-sectional area, in square millimetres [square inches],
9.1.4 Maximum load, in kilonewtons [pounds-force],
9.1.5 Compressive strength to the nearest 0.1 MPa [10 psi],
9.1.6 Type of fracture (see Fig. 2),
9.1.7 Defects in either specimen or caps, and,
9.1.8 Age of specimen.
9.1.9 When determined, the density to nearest 10 kg/m$^3$ [1 lb/ft$^3$].
Impact

- **Uniformity in test methods is highly beneficial**
  - Properly trained testing technicians
  - Certified testing labs

- **Implicit results are dangerous**
  - Assumptions based on NON-REPORTED information can create FALSE conclusions.

- **User based experience can be incorporated into changes to standards**
Questions

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