



Standard Test Method for The Break-Off Number of Concrete¹

This standard is issued under the fixed designation C 1150; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method² covers determination of the break-off number of hardened concrete in test specimens or structures, by measuring the force required to cause failure of a pre-cast or drilled core specimen loaded as a cantilever.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

E 178 Practice for Dealing with Outlying Observations³

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials⁴

C 823 Practice for Examination and Sampling of Hardened Concrete in Constructions⁴

3. Summary of Test Method

3.1 The principle of the break-off test is illustrated in Fig. 1. A plastic sleeve with an annular seating ring is inserted in fresh concrete to form a cylindrical test specimen and a counter bore. After the concrete has hardened, the sleeve is removed and a force is applied at the uppermost section of the cylinder so as to break the cylindrical test specimen from the concrete mass. The test result is reported as a break-off number, which is the maximum pressure recorded by the gage measuring the hydraulic pressure in the loading mechanism. In hardened concrete, in cases where the plastic sleeve has not been installed, a concrete coring machine with a specially shaped coring drill bit may be used to drill a similarly shaped test specimen.

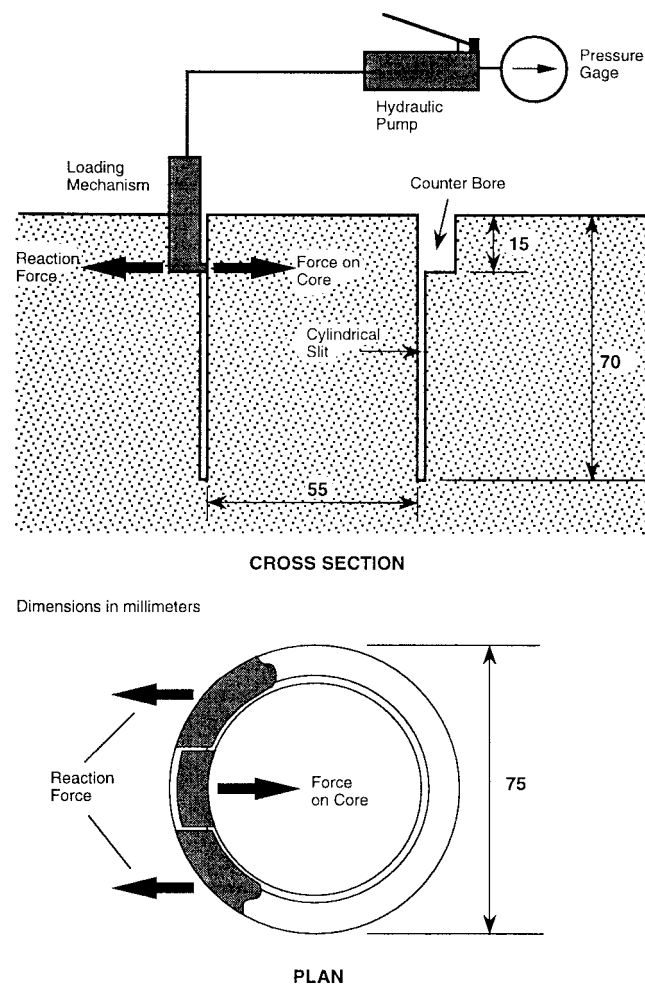


FIG. 1 Schematic of Break-Off Test

4. Significance and Use

4.1 The break-off number determined by this test method may be used to assess the in-place strength of concrete, and to delineate zones, regions, or areas of varying quality or deteriorated concrete in structures.

4.2 Prior to using this test method for determining in-place strength, a correlation relationship between the break-off number and the concrete strength should be established. Since such a correlation may vary with type and size of aggregates and method of specimen preparation, a relationship may be developed to take these and other variables into account. This

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² The break-off method is covered by a patent held by SINTEF, Norwegian Institute of Technology, Trondheim, Norway. Interested parties are invited to submit information regarding the identification of acceptable alternatives to this patented item to The Committee on Standards, ASTM Headquarters, 100 Barr Harbor Drive, West Conshohocken, PA 19428. Your comments will receive careful consideration at a meeting of the responsible technical committee which you may attend.

³ Annual Book of ASTM Standards, Vol 14.02.

⁴ Annual Book of ASTM Standards, Vol 04.02.

relationship must be established for each new combination of concrete-making materials. In developing such relationships, care must be taken to ensure that the break-off specimens and the strength test specimens undergo similar curing histories up to the time of the test.

NOTE 1—Published reports (1-8)⁵ by different researchers present their experience in the use and evaluation of the break-off test equipment and in establishing break-off strength correlation with compressive strength of concrete.

4.3 The break-off test may be used to evaluate the in-place concrete in order to:

- 4.3.1 Determine if formwork or reshoring can be removed,
- 4.3.2 Test if concrete meets break-off number specifications,
- 4.3.3 Determine when prestressing strands may be cut to release the prestressing force,
- 4.3.4 Determine if concrete has sufficient strength to allow post-tensioning to proceed,
- 4.3.5 Estimate efficiency of curing techniques, and
- 4.3.6 Evaluate the effects of exposure to environmental or chemical attack.

4.4 When planning the break-off test and analyzing test results, consideration should be given to (1) the normally expected decrease of concrete strength with increasing height within a given concrete placement in a structural element (see 9-11), and (2) locations with less favorable curing conditions prior to form removal.

4.5 Break-off tests are not recommended for concrete with a nominal maximum aggregate size greater than 25 mm. The within test variability of the break-off test has been found to increase in concrete with larger aggregate size (see (6) and (11)).

4.6 The cylindrical break-off specimens may be kept and used for additional testing. The break-off test shall not be performed on concrete that is at a temperature of less than -5°C. Prior to starting a testing program the break-off tester must be calibrated according to the manufacturer's procedure (using the calibrator force gage and calibration diagram provided with the test unit) to ensure a consistent relationship between the pressure gage reading and the force applied by the loading mechanism.

5. Apparatus

5.1 The apparatus consists of a loading mechanism, a load generating device, a load measuring instrument, a tubular sleeve and seating ring of the dimensions shown in Fig. 2, a tubular sleeve remover, and a gage for calibrating or adjusting the loading system. The tubular sleeve shall be of a material that is resistant to chemical attack by concrete. It shall be rigid enough to maintain a reproducible size of test specimen. It shall be coated with a release agent that is not reactive with concrete prior to inserting it in the concrete. Plastic is an acceptable sleeve material and automotive grease is a suitable release agent.

5.2 For applications where tests are to be performed in already hardened concrete, a diamond tipped drill bit is used,

⁵ The boldface numbers in parentheses refer to the list of references appended to this test method.

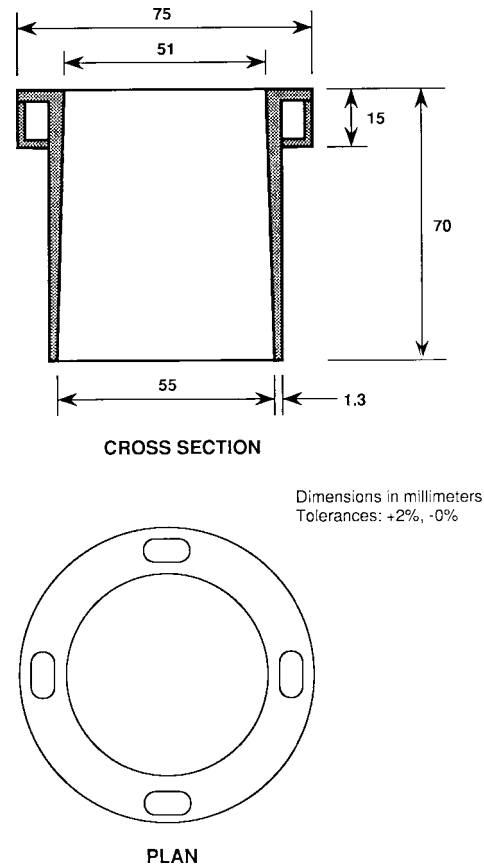


FIG. 2 Sleeve for Creating Test Specimen in Fresh Concrete

which produces a core with a circular counterbore at the surface with dimensions as shown in Fig. 3.

5.3 The loading mechanism shall consist of a tubular shaped fixture that fits into the counterbore, and a hydraulic piston which when actuated applies a force at the top of the core, perpendicular to the longitudinal axis of the core.

NOTE 2—The loading mechanism may include both a high and low measuring range capability to permit strength test of concrete over a wider range. A correlation relationship must be developed using the range setting that will be used during strength assessment.

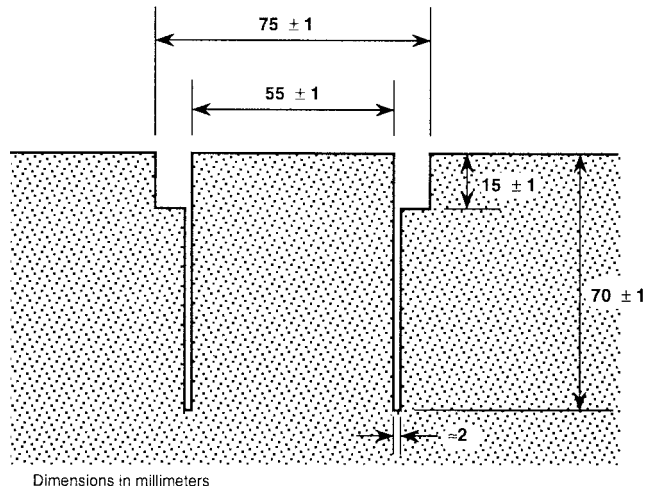


FIG. 3 Dimensions of Test Specimen Created by Core Drill