Standard Method of Test for

Determining the Rebound Number of Hardened Concrete

SCDOT Designation: SC-T-49 (6/14)

1. SCOPE

This test method covers the determination of a rebound number of hardened concrete using a spring-driven steel hammer. The values stated in SI units are to be regarded as the standard. 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 C805 Standard Test Method for Rebound Hammer of Hardened Concrete

3. SUMMARY OF TEST METHOD

3.1 A steel hammer impacts with a predetermined amount of energy, a steel plunger in contact with a surface of concrete, and the distance that the hammer rebounds is measured.

4. SIGNIFICANCE AND USE

4.1 This test method may be used to assess the in-place uniformity of concrete, to delineate regions in a structure of poor quality or deteriorated concrete, and to estimate in-place strength development.

4.2 To use this test method to estimate strength requires establishing a relationship between strength and rebound number. The relationship shall be established for a given concrete mixture and given apparatus. The relationship shall be established over the range of concrete strength that is of interest. To estimate strength during construction, establish the relationship by performing rebound number tests on molded specimens and measuring the strength of the same or companion molded specimens. To estimate strength in an existing structure, establish the relationship by correlating rebound numbers measured on the structure with the strengths of cores taken from corresponding locations.

4.3 For a given concrete mixture, the rebound number is affected by factors such as moisture content of the test surface, the method used to obtain the test surface (type of form material or type of finishing), and the depth of carbonation. These factors need to be considered in preparing the strength relationship and interpreting test results.

5. APPARATUS

5.1 Rebound Hammer, consisting of a spring-loaded steel hammer which when released strikes a steel plunger in contact with the concrete surface. The spring-loaded hammer must travel with a consistent and reproducible velocity. The rebound distance of the steel hammer from the steel plunger is measured on a linear scale attached to the frame of the instrument.

NOTE 1 - Several types and sizes of rebound hammers are commercially available to accommodate testing of various sizes and types of concrete construction.

5.2 Abrasive Stone, consisting of medium-grain texture silicon carbide or equivalent material.

5.3 Verification anvil, used to check the operation of the rebound hammer. An instrument guide is provided to center the rebound hammer over impact area and keep the instrument perpendicular to the anvil surface. The anvil shall be constructed so that it will result in a rebound number of at least 75 for a properly operating instrument.

NOTE 2 - A suitable anvil has included an approximately 150-mm (6-in.) diameter by 150-mm (6-in) tall steel cylinder with an impact area hardened to an HRC hardness value 64 to 68.

6. TEST AREA

6.1 Selection of Test Surface—Concrete members to be tested shall be at least 100 mm (4 in.) thick and fixed within a structure. Smaller specimens must be rigidly supported. Areas exhibiting honeycombing, scaling, or high porosity should be avoided. Troweled surfaces generally exhibit higher rebound numbers than screeded or formed finishes. If possible, structural slabs should be tested from the underside to avoid finished surfaces.

6.2 Preparation of Test Surface—A test area shall be at least 150 mm (6 in.) in diameter. Heavily textured, soft, or surfaces with loose mortar shall be ground smooth with the abrasive stone described in 5.2 Smooth-formed or troweled surfaces do not have to be ground prior to testing.

6.2.1 Ground and unground surfaces should not be compared.

6.3 Other factors that may affect the results of the test are as follows:

6.3.1. Concrete at 0°C (32°F) or less may exhibit very high rebound values. Concrete should be tested only after it has thawed.

6.3.2. The temperatures of the rebound hammer itself may affect the rebound number.

NOTE 3 - Rebound hammers at -18^{0}C (0°F) may exhibit rebound numbers reduced by as much as 2 or 3.

6.3.3. For readings to be compared the direction of impact, horizontal, downward, upward, etc., must be the same or established correction factors shall be applied to the readings.

6.3.4. Do not conduct tests directly over reinforcing bars with cover less than 20 mm (0.75 in.)

6.3.5. Different hammers of the same nominal design may give rebound numbers differing from 1 to 3 units and therefore, tests should be made with the same hammer in order to compare results. If more than one hammer is to be used, a sufficient number of tests must be made on typical concrete surfaces so as to determine the magnitude of the differences to be expected.

6.3.6. Rebound hammers shall be serviced and verified semiannually and whenever there is reason to question their proper operation. Test anvils described in 5.3 are recommended for verification.

NOTE 4 - Typically, a properly operating rebound hammer and a properly designed anvil should result in a rebound number of about 80. Verification on an anvil will not guarantee that the hammer will yield repeatable data at other points on the scale. Some users compare the usual range of rebound numbers encountered in the field.

7. PROCEDURE

7.1 Hold the instrument firmly so that the plunger is perpendicular to the test surface. Gradually push the instrument toward the test surface until the hammer impacts. After impact, maintain pressure on the instrument and, if necessary, depress the button on the side of the instrument to lock the plunger in its retracted position. Read the rebound number on the scale to the nearest whole number and record the rebound number. Take 10 readings from each test area. No two-impact points shall be closer together than 25 mm (1 in.) and the distance between impact points and edges of the member shall be at least 50 mm (2 in). Examine the impression made on the surface after impact, and if the impact crushes or breaks through a near-surface air void disregard the reading and take another reading.

8. CALCULATION

8.1 Discard readings differing from the average of 10 readings by more than 6 units and determine the average of the remaining readings. If more than 2 readings differ from the average by 6 units, discard the entire set of readings and determine rebound numbers at 10 new locations within the test area. If readings appear to be erroneous due to extremely high or extremely low rebound numbers, discard these readings without recording them. Extreme high and low readings are generally due to air-voids, steel reinforcement, or coarse aggregates close to the surface. The average rebound number can then be applied to the proper rebound number chart to get an estimated compressive strength.

9. REPORT

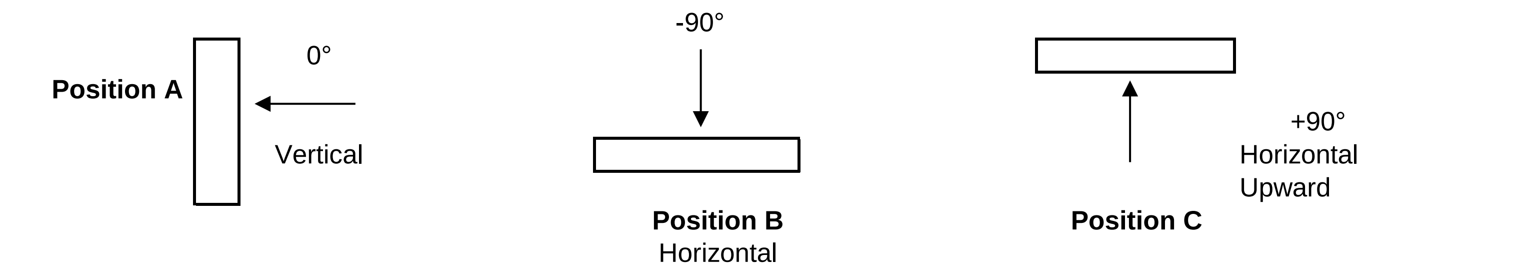
None.

Note: A letter is typically sent to the RCE with the following information.

- *Date*
- *Identification of location tested*
- *Design strength of concrete tested*
- *Hammer identification*
- *Orientation of hammer during test*
- *Average rebound number*
- *Strength, PSI (MPa)*
- *Remarks regarding unusual conditions*

File No. ______
Project No. ______
Charge Code ______
Hammer No. ______
Date ______

Person(s) Present for Test



Cylinder Lab No. ______ Station or ID ______
Date cylinder made ______ Cylinder strength ______ Age ______
Cylinder ID Concrete surface condition

READINGS

1		4		7		10	
2		5		8			
3		6		9			

Total ______ Avg. of ______ Chart PSI ______
Mean error ± 6 Reading Range ______

Position

Cylinder Lab No. ______ Station or ID ______
Date cylinder made ______ Cylinder strength ______ Age ______
Cylinder ID Concrete surface condition

READINGS

1		4		7		10	
2		5		8			
3		6		9			

Total ______ Avg. of ______ Chart PSI ______
Mean error ± 6 Reading Range ______

Position

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READINGS

1		4		7		10	
2		5		8			
3		6		9			

Total ______ Avg. of ______ Chart PSI ______
Mean error ± 6 Reading Range ______

Position

Remarks ______

Form 700.18 (6-14) Rev.

______
SCDOT Inspector