WSDOT FOP for C 805[1]

Rebound Hammer Determination of Compressive Strength of Hardened Concrete

1. Scope

1.1 This test method covers the determination of a rebound number of hardened concrete using a spring-driven steel hammer.

1.2 The values stated in inch-pound 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

C 125 Terminology Relating to Concrete and Concrete Aggregates

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

E 18 Test Methods for Rockwell and Rockwell Superficial Hardness of Metallic Materials

3. Significance and Use

3.1 This test method is not intended as the basis for acceptance or rejection of concrete because of the inherent uncertainty in the estimated strength.

4. Apparatus

4.1 Rebound Hammer – Consisting of a spring-loaded steel hammer that 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: Use type N rebound hammers that are commercially available to accommodate testing of various sizes and types of concrete construction.

4.2 Abrasive Stone – Consisting of medium-grain texture silicon carbide or equivalent material.

4.3 Test Anvil – Approximately 150 mm (6 in) diameter by 150 mm (6 in) high cylinder made of tool steel with an impact area hardened to 66 ± 2 HRC as measured by test method ASTM E 18. An instrument guide is provided to center the rebound hammer over the impact area and keep the instrument perpendicular to the surface.

[1]This FOP is based on ASTM C 805 and has been modified per WSDOT standards. To view the redline modifications, contact the WSDOT Quality Systems Manager at 360-709-5412.

4.4 Verification – Rebound hammers shall be serviced and verified annually and whenever there is reason to question their proper operation. Verify the functional operation of a rebound hammer using the test anvil described in Section 4.3. During verification, support the test anvil on a bare concrete floor or slab. The manufacturer shall report the rebound number to be obtained by a properly operating instrument when tested on an anvil of specified hardness.

Note 2: Typically, a rebound hammer will result in a rebound number of 80 ± 2 when tested on the anvil described in Section 4.3. The test anvil needs to be supported on a rigid base to obtain reliable rebound numbers. Verification on the test anvil does not guarantee that the hammer will yield repeatable data at other points on the scale. The hammer can be verified at lower rebound numbers by using blocks of polished stone having uniform hardness. Some users compare several hammers on concrete or stone surfaces encompassing the usual range of rebound numbers encountered in the field.

5. Test Area and Interferences

5.1 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. Avoid areas exhibiting honeycombing, scaling, or high porosity. Do not compare test results if the form material against which the concrete was placed is not similar. Troweled surfaces generally exhibit higher rebound numbers than screeded or formed finishes. If possible, test structural slabs from the underside to avoid finished surfaces.

5.2 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 flat with the abrasive stone described in Section 4.2. Smooth-formed or troweled surfaces do not have to be ground prior to testing. Do not compare results from ground and unground surfaces.

5.3 Do not test frozen concrete.

Note 3: Moist concrete at 0°C (32°F) or less may exhibit high rebound values. Concrete should be tested only after it has thawed. The temperatures of the rebound hammer itself may affect the rebound number. Rebound hammers at -18°C (0°F) may exhibit rebound numbers reduced by as much as two or three units (1 unit = 1 whole number).

5.4 For readings to be compared, the direction of impact, horizontal, downward, upward, or at another angle, must be the same or established correction factors shall be applied to the readings.

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

***Note 4*:** The location of reinforcement may be established using reinforcement locators or metal detectors. Follow the manufacturer's instructions for proper operation of such devices.

6. Procedure

6.1 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 ten readings from each test area. No two impact tests shall be closer together than 25 mm (1 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.

7. Calculation

7.1 Discard readings differing from the average of ten readings by more than six units and determine the average of the remaining readings. If more than two readings differ from the average by six units, discard the entire set of readings and determine rebound numbers at ten new locations within the test area.

8. Report

8.1 Report the following information for each test area:

8.1.1 Date and time of testing.

8.1.2 Identification of location tested in the concrete construction and the type and size of member tested.

8.1.2.1 Description of the concrete mixture proportions including type of coarse aggregates if known.

8.1.2.2 Design strength of concrete tested.

8.1.3 Description of the test area including:

8.1.3.1 Surface characteristics (trowelled, screeded) of area.

8.1.3.2 If surface was ground and depth of grinding.

8.1.3.3 Type of form material used for test area.

8.1.3.4 Curing conditions of test area.

8.1.3.5 Type of exposure to the environment.

8.1.4 Hammer identification and serial number.

8.1.4.1 Air temperature at the time of testing.

8.1.4.2 Orientation of hammer during test.

8.1.5 Average rebound number for test area.

8.1.5.1 Remarks regarding discarded readings of test data or any unusual conditions.

10. Precision and Bias

See ASTM C 805 precision and bias.

Performance Exam Checklist

Rebound Hammer Determination of Compressive Strength of Hardened Concrete
FOP for ASTM C 805

Participant Name _____ Exam Date _____

Procedure Element		
Preparation	**Yes**	**No**
1. Copy of current procedure available at test site?	☐	☐
2. Hammer properly serviced and calibrated or verified?	☐	☐
3. Test location properly prepared?	☐	☐
4. Test location meets minimum size requirement?	☐	☐
5. Ten acceptable readings taken in each test area?	☐	☐
6. Readings properly spaced in test area?	☐	☐
7. Test readings properly converted to estimated strength?	☐	☐
8. Test information properly recorded?	☐	☐
9. All calculations performed correctly?	☐	☐
Equipment		
10. Are calibration/verifications tags present on equipment used in this procedure?	☐	☐
11. All equipment functions according to the requirements of this procedure?	☐	☐

First Attempt: Pass ☐ Fail ☐ Second Attempt: Pass ☐ Fail ☐

Signature of Examiner _____

Comments: