RTH 105-93

METHOD FOR DETERMINATION OF REBOUND NUMBER OF ROCK

1. Scope

1.1 This method provides instructions for the determination of a rebound number of rock using a spring-driven steel hammer (Fig. 1).

1 Impact plunger
3 Housing compl.
4 Rider with guide rod
5 Scale (starting with serial No. 230 printed on window No. 19)
6 Pushbutton compl.
7 Hammer guide bar
8 Disk
9 Cap
10 Two-part ring
11 Rear cover
12 Compression spring
13 Pawl
14 Hammer mass
15 Retaining spring
16 Impact spring
17 Guide sleeve
18 Felt washer
19 Plexiglass window
20 Trip screw
21 Lock nut
22 Pin
23 Pawl spring

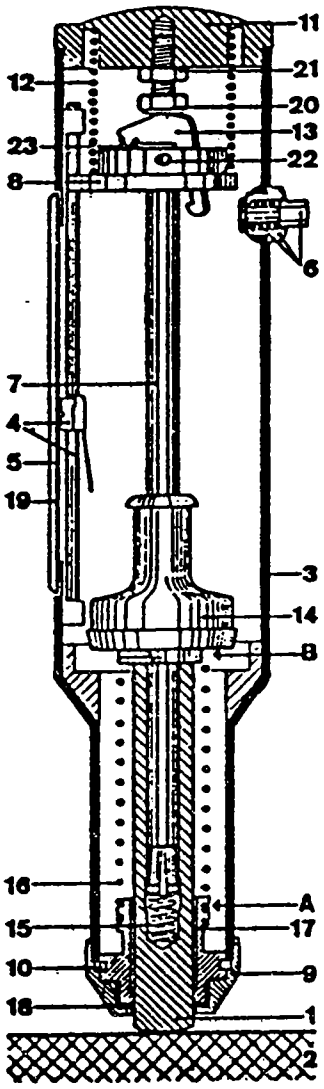

Fig. 1. Spring-driven steel hammer.

2. Significance

2.1 The rebound number determined by this method may be used to assess the uniformity of rock in situ, or on cored samples to indicate hardness characteristics of the rock.

3. Apparatus

3.1 Rebound Hammer - The rebound hammer consists of a spring-loaded steel hammer which when released strikes a steel plunger which is in contact with the test surface. The spring-loaded hammer must travel with a fixed and reproducible velocity. The rebound distance of the steel hammer from the steel plunger is measured by means of a linear scale attached to the frame of the instrument (Note 1).

NOTE 1--Several types and sizes of rebound hammers are commercially available. Hammers with an energy impact of 0.075 m-kg (0.542 ft-lb) have been found satisfactory for rock testing.

3.2 Abrasive Stone - An abrasive stone consisting of medium grain texture silicon carbide or equivalent material shall be provided.

4. Test Area

4.1 Selection of Test Surface - Surfaces to be tested shall be at least 2 in. (50 mm) thick and fixed within a stratum. Specimens should be rigidly supported. Some companies market a "rock cradle" for this purpose. Areas exhibiting scaling, rough texture, or high porosity should be avoided. Dry rocks give higher rebound numbers than wet.

4.2 Preparation of Test Surface - Heavily textured soft surfaces or surfaces with loose particles shall be ground smooth with the abrasive stone described in Section 3.2. Smooth surfaces shall be tested without grinding. The effects of drying and carbonation can be minimized by thoroughly wetting the surfaces for 24 hours prior to testing.

4.3 Factors Affecting Test Results - Other factors related to test circumstances may affect the results of the test:

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

(b) The temperature of the rebound hammer itself may affect the rebound number (Note 2).

NOTE 2—Rebound hammers at 0°F (-18°C) may produce rebound numbers reduced by as much as 2 or 3 units.

(c) For readings to be compared, the direction of impact—horizontal, downward, upward, etc.—must be the same.

(d) Different hammers of the same nominal design may give rebound numbers differing by 1 to 3 units, and therefore, to be compared, tests should be made with a single hammer. If more than one hammer is to be used, a sufficient number of tests must be made on typical rock surfaces to determine the magnitude of the differences to be expected. (Note 3)

NOTE 3—Rebound hammers require periodic servicing and verification annually for hammers in heavy use, biennially for hammers in less frequent use, and whenever there is reason to question their proper operation. Metal anvils are available for verification and are recommended. However, verification on an anvil will not guarantee that different hammers will yield the same results at other points on the rebound scale. Some users compare several hammers on surfaces encompassing the usual range of rebound values encountered in the field.

5. Test Procedure

5.1 The instrument shall be firmly held in a position which allows the plunger to strike perpendicular to the surface tested. The pressure on the plunger shall be gradually increased until the hammer impacts. After impact, the rebound number should be recorded to two significant figures. Ten readings shall be taken from each test area with no two impact tests being closer together than 1 in. (25.4 mm). Examine the impression made on the surface after impact and disregard the reading if the impact crushes or breaks through the surface.

6. Calculation

6.1 Readings differing from the average of 10 readings by more than 7 units are to be discarded and the average of the remaining readings determined. If more than 2 readings differ from the average by 7 units, the entire set of readings should be discarded.

7. Precision

7.1 The single-specimen-operator-machine-day precision is 2.5 units (1S) as defined in ASTM Recommended Practice E 177, "Use of the Terms Precision and Accuracy as Applied to Measurement of a Property of a Material."

8. Use and Interpretation of Rebound Hammer Results

8.1 Optimally, rebound numbers may be correlated with core testing information. There is a relationship between rebound number and strength and deformation and the relationship is normally provided by the rebound hammer manufacturer.

9. Report

9.1 The report should include the following information for each test area:

9.1.1 Rock identification.

9.1.2 Location of rock stratum.

9.1.3 Description and composition of rock if known.

9.1.4 Average rebound number for each test area or specimen.

9.1.5 Approximate angular direction of rebound hammer impact, with horizontal being considered 0, vertically upward being +90 deg (1.57 radians), and vertically downward being -90 deg (1.57 radians).

9.1.6 Hammer type and serial number.