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Standard Test Method for Determining Rock Quality Designation (RQD) of Rock Core[1]

This standard is issued under the fixed designation D 6032; 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 method covers the determination of the rock quality designation (RQD) as a standard parameter in drill core logging.

1.2 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice D 6026.

1.2.1 The method used to specify how data are collected, calculated, or recorded in this standard is not directly related to the accuracy to which the data can be applied in design or other uses, or both. How one applies the results obtained using this standard is beyond its scope.

~~1.3The values stated in SI units are to be regarded as the standard. The values stated in inch-pound units are approximate.~~

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

1.4 *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:* [2]

D 653 Terminology Relating to Soil, Rock, and Contained Fluids

D 2113 Practice for Rock Core Drilling and Sampling of Rock for Site Investigation

D 3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

D 5079 Practices for Preserving and Transporting Rock Core Samples

D 6026 Practice for Using Significant Digits in Geotechnical Data

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Terminology

3.1 For terminology used in this test method, refer to Terminology D 653.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *core run*—in the most basic usage, the length of the interval measured from the depth each core sample was started to the depth at which drilling stopped and the sample was recovered from the core barrel. If required, the core run can also be defined to cover a specific length or lithology in the core samples.

3.2.2 *drill break*—any mechanical or man-made break in the core that is not natural occurring.

3.2.3 *intact core*—any segment of core between two open, natural discontinuities.

3.2.4 *rock quality designation (RQD)*—a modified core recovery percentage in which all pieces of sound core over 100 mm are counted as recovery.

3.2.5 *sound core*—any core which is fresh to moderately weathered and which has sufficient strength to resist hand breakage.

4. Summary of Test Method

4.1 The RQD denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100 mm (4 in.) long are summed and divided by the total length of the core run, as shown in Fig. 1. Rock mechanics judgement may be necessary to determine if a piece of core qualifies as being intact and sound.

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[1] This test method is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.12 on Rock Mechanics.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard.**

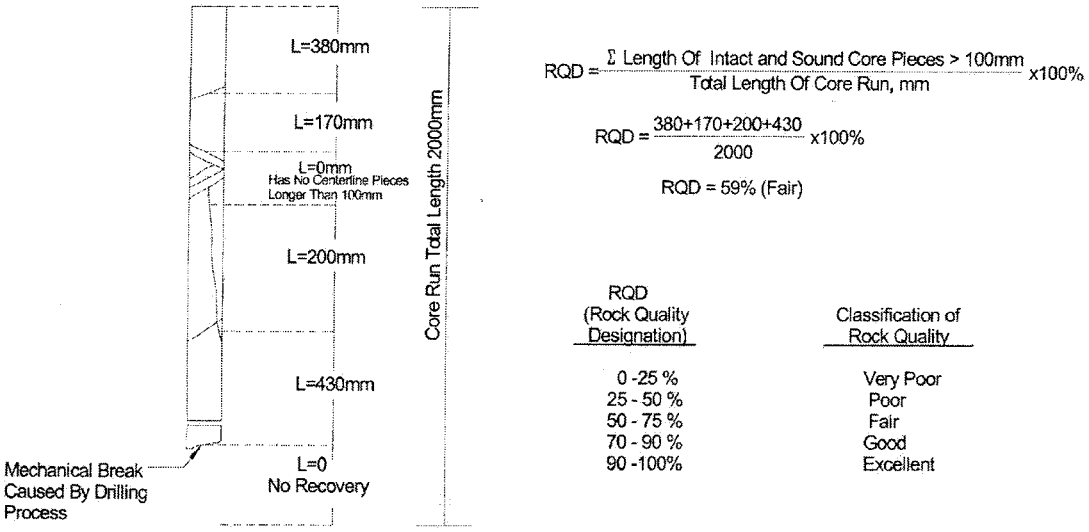

FIG. 1 RQD Logging Center Line Method[3]

5. Significance and Use

5.1 The RQD was first introduced in the mid ~~1960's~~1960s to provide a simple and inexpensive general indication of rock mass quality to predict tunnelling conditions and support requirements. The recording of RQD has since become virtually standard practice in drill core logging for a wide variety of geotechnical investigations.

5.2 The RQD values provide a basis for making preliminary design decisions involving estimation of required depths of excavation for foundations of structures. The RQD values also can serve to identify potential problems related to bearing capacity, settlement, erosion, or sliding in rock foundations. The RQD can provide an indication of rock quality in quarries for concrete aggregate, rockfill, or large riprap.

5.3 The RQD has been widely used as a warning indicator of low-quality rock zones that may need greater scrutiny or require additional borings or other investigational work.

5.4 The RQD is a basic component of many rock mass classification systems for engineering purposes.

5.5 Used alone, RQD is not sufficient to provide an adequate description of rock mass quality. The RQD does not account for joint orientation, tightness, continuity, and gouge material. The RQD must be used in combination with other geological and geotechnical input.

5.6 The RQD is sensitive to the orientation of joint sets with respect to the orientation of the core. That is, a joint set parallel to the core axis will not intersect the core, unless the drill hole happens to run along the joint. A joint set perpendicular to the core axis will intersect the core axis at intervals equal to the joint spacing. For intermediate orientations, the spacing of joint intersections with the core will be a cosine function of angle between joints and the core axis.

5.7 Core sizes from BQ to PQ with core diameters of 36.5 mm (1.44 in.) and 85 mm (3.35 in.), respectively, are normally acceptable for measuring RQD as long as proper drilling techniques are used that do not cause excess core breakage or poor recovery, or both. The NX-size (54.7 mm [2.16 in.]) and NQ-size (47.5 mm [1.87 in.]) are the optimal core sizes for measuring RQD. The RQD is also useful for large core diameters provided the core diameter is clearly stated. The RQD calculated for core smaller than BQ may not be representative of the true quality of the rock mass.

NOTE 1—The quality of the result produced by this standard is dependent on the competence of the personnel performing it, and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D 3740 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with Practice D 3740 does not in itself assure reliable results. Reliable results depend on many factors; Practice D 3740 provides a means of evaluating some of those factors.

6. Procedure

6.1 Drilling of the rock core should be done in accordance with Practice D 2113. It is important that proper drilling techniques and equipment are used to minimize core breakage or poor core recovery, or both.

6.2 There are several ways to define a core run for calculating RQD. Three of these are: (*1*) a core run is equal to a drill run; (*2*) a change in formation or rock type could constitute an end of a core run; and (*3*) a core run can be a selected zone of concern. In determining a core run it is important to be consistent throughout a drill hole and to document how the core run was defined.

6.3 Retrieval, preservation, transportation, storage, and cataloging of the rock core should be done in accordance with Practices D 5079. The RQD should be logged on site when the core is retrieved because some rocks can disintegrate, due to poor curatorial handling, slaking, desiccation, stress relief, or swelling, with time. For these rocks it is recommended that the RQD be measured