

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

TEST METHOD FOR UNCONFINED COMPRESSIVE STRENGTH OF ROCK CORE
SPECIMENS

1.0 PURPOSE

- 1.1 To establish a procedure for testing the unconfined compressive strength of rock core specimens.

2.0 SCOPE

- 2.1 This procedure shall apply to nominal 2-inch (51 mm) diameter rock core specimens obtained for the purpose of determining the uniaxial compressive strength of rock.
- 2.2 This procedure will specify the requirements for the apparatus to be used in the test procedure, specimen preparation, and the actual test procedure.

3.0 APPARATUS

- 3.1 Diamond Saw – A manual or automatic rock saw equipped with a circular diamond saw blade, and appropriate cooling and cutting agents.
- 3.2 Feeler Gage – The feeler gage 3 inch (76 mm) “leaves” must include sizes beginning at 0.0015 inches (.038 mm).
- 3.3 Testing Machine – The testing machine shall meet the requirements for the testing machine specified in ASTM C 109.

4.0 SPECIMENS

- 4.1 Test specimens shall be nominal 2-inch (51 mm) diameter rock cores with a length-to-diameter ratio (L/D) of 2.0 to 2.5 and a diameter of not less than 1.88-inches (47 mm).

- 4.1.1 The field moisture condition of the test specimen shall be preserved until the time of the test unless otherwise specified.
- 4.2 The sides of the specimen shall be generally smooth and free of abrupt irregularities that, as determined by the technician performing the test, would adversely affect the compressive strength result.
- 4.3 Cut the ends of the specimens parallel to each other and at right angles to the longitudinal axis using a diamond saw.
- 4.4 Determine the diameter of the test specimen to the nearest 0.01 inches (0.25 mm) by averaging two diameters measured at right angles to each other at about mid-height of the specimen. Determine the length of the test specimen to the nearest 0.01 inches (0.25 mm) at the centers of the end faces.
- 4.5 When the Modified Rock Hardness and Unconfined Compressive Strength (HCSI) of the specimen is 3 or less (average rock – corresponding to an estimated compressive strength of $\leq 8,000$ psi (55 MPa)), the ends of the specimens shall be capped with high-strength gypsum cement paste in accordance with ASTM C 617.
- 4.6 When the Modified Rock Hardness and Unconfined Compressive Strength (HCSI) of the specimen is 4 or greater (hard rock – corresponding to an estimated compressive strength of $> 8,000$ psi (55 MPa)), the ends of the specimens shall be sawed or ground flat to a tolerance not to exceed 0.002 inches (0.050 mm).
- 5.0 PROCEDURE
- 5.1 Ensure that the spherically seated block of the testing machine rotates freely in its socket before each test. Wipe clean the bearing faces of the upper and lower bearing blocks and place the test specimen in the testing machine on the lower bearing block below the center of the upper bearing block. Bring the spherically seated block into uniform contact with the surface of the specimen.
- 5.2 Apply the load at a relative rate of movement between the upper and lower platens corresponding to a loading on the specimen within the range of 35 ± 7 psi/s (0.25 ± 0.05 MPa/s). Obtain this designated rate of movement of the platen during the first half of the anticipated maximum load and make no adjustment in the rate of movement of the platen in the latter half of the loading.
- 5.3 Record the maximum load carried by the specimen. Load readings in pounds (kilonewtons) shall be recorded to the nearest 10 lbs. (0.01 KN).

6.0 CALCULATION

6.1 Calculate the compressive strength of the specimen as described in section 6.2 and express the result to the nearest 10 psi (0.1 MPa).

6.2 Calculate the compressive strength of the specimen as follows:

$$CS = \frac{ML}{0.25 \times \pi \times D^2}$$

Where:

CS = Compressive strength of the specimen

ML = Maximum load carried by the specimen during the test

Π = Mathematical constant Π

D = Average diameter of the specimen (as determined in section 4.4)

7.0 REPORT

7.1 The report shall include the following:

7.1.1 Laboratory number;

7.1.2 Project name, project number, and authorization number;

7.1.3 Date of test;

7.1.4 Core boring number and depth of specimen from the top of the hole;

7.1.5 Station and offset of the core boring;

7.1.6 Specimen diameter and length as determined in section 4.4;

7.1.7 Specimen end preparation method (capping, sawing, or grinding);

7.1.8 Maximum load as determined in section 5.3;

7.1.9 Compressive strength as determined in section 6.2;

7.1.10 Physical description of the rock specimen (type, color, and grain size).

7.2 Use Attachment 1 as the format for the report.

A handwritten signature in black ink that reads "Aaron C. Gillispie". The signature is written in a cursive, flowing style.

Aaron C. Gillispie, P.E.
Director
Materials Control, Soils and Testing Division

ACG:Mm

Attachment

WEST VIRGINIA DIVISION OF HIGHWAYS MATERIALS CONTROL, SOILS AND TESTING DIVISION UNCONFINED COMPRESSIVE STRENGTH OF ROCK CORES			
Laboratory Number:			
Project Name:			
Project Number:		Authorization Number:	
Date of Test:		Core Boring Number:	
Station:		Offset:	
Applicable Units (check appropriate box):		English ☐ Metric ☐	
Depth From Top of Hole (ft / m)			
Diameter (in. / mm)			
Average Diameter (in. / mm)			
Length (in. / mm)			
End Preparation Method			
Maximum Load (lb. / KN)			
Compressive Strength (psi / MPa)			
Physical Description of Rock: Type: Color: Grain Size:			
Remarks: 			