



Rock Specimen Requirements

FOR MORE INFORMATION, CALL MARK DOBDAY AT 978.635.0424

TEST METHOD	REFERENCE METHOD	RESULT PROVIDED	WHAT IT MEANS
CERCHAR ABRASIVITY INDEX (CAI) MIN SAMPLE SIZE: Length of core = 2-4" # OF SPECIMENS: 1 specimen, 5 readings	D7625	CAI	Assess the abrasiveness of rock for mechanical excavation. Rock abrasiveness governs the performance of disc cutters, rate of replacement, and subsequent tunnel costs.
DIRECT SHEAR OF INTACT ROCK MIN SAMPLE SIZE: Length of core = 6-12" # OF SPECIMENS: 3 specimens	D5607	Density, peak- and post-peak shear stress, peak- and post-friction angles	Determines shear strength of rock specimen, an important aspect in design of structures such as rock slopes, dam foundations, tunnels, shafts, etc. Measure peak shear and residual strength of intact rock, a specific rock discontinuity or an intact interface surface (rock-to-rock, rock-to-concrete or concrete lift line.) If tests are run at multiple normal stresses, friction angle and cohesion value can also be determined.
DIRECT SHEAR-SLIDING FRICTION MIN SAMPLE SIZE: Length of core = 2-4" # OF SPECIMENS: 1 specimen	D5607	Density, peak- and post-peak shear stress, peak- and post-friction angles	Measure of peak shear resistance and residual strength of a rock specimen containing an open discontinuity (such as open joint, bedding surfaces or saw cut surface.) If tests are run at multiple normal stresses the friction angle and cohesion value can also be determined.
DIRECT TENSILE STRENGTH MIN SAMPLE SIZE: Length of core = (2-2.5 x diameter of core) + 1-2" # OF SPECIMENS: 1 specimen	D2936	Density, tensile strength	Rock is much weaker in tension than in compression. Many engineers employ tensile strength as the failure strength of rock.
DRILLABILITY TEST SUITE: NTNU'S 13A-98 Drillability Test Methods and Brittleness Value (S20), Sievers' J-Value (SJ), Abrasion Value (AV), and Abrasion Value Cutter Steel (AVS) →Drilling Rate Index, Bit Wear Index, and Cutter Life Index MIN SAMPLE SIZE: 15-20 kg representative material (about 10' of core) # OF SPECIMENS: 1 specimen per rock type	SINTEF'S DRI, BWI, CLI standards - 2003	S20, SJ, AV, AVS, Drilling Rate Index, Bitwear Index, Cutter Life Index, density, petrographic analysis (optional)	Helps determine the rate of drilling, which drill bits to use, and how long the bits will last for TBM machine. The Trademarked acronyms and terms DRI™, BWI™, CLI™, SAT™, Drilling Rate Index™, Bit Wear Index™, Cutter Life Index™ and Soil Abrasion Index™ are unique for test results and calculated indices originating from NTNU/SINTEF and can only be obtained by testing samples at their reference laboratory in Trondheim Norway.
DURABILITY - FREEZE-THAW MIN SAMPLE SIZE: At least 6 representative boulders large enough to obtain one 5.5" x 5.5" x 2.5" slab from each # OF SPECIMENS: 5 if same rock type; 8 if different rock types	D5312	Percent material lost during testing	Helps evaluate the durability of rock used for erosion control when exposed to freezing and thawing conditions.
DURABILITY - WET-DRY MIN SAMPLE SIZE: At least 6 representative boulders large enough to obtain one 5.5" x 5.5" x 2.5" slab from each # OF SPECIMENS: 5 if same rock type; 8 if different rock types	D5313	Percent material lost during testing	Weathering test exposes rock to wetting, and drying cycles similar to fluctuating water levels and weather conditions. It helps evaluate the durability of rock exposed to similar conditions.
DURABILITY BY SODIUM OR MAGNESIUM SULFATE MIN SAMPLE SIZE: At least 6 representative boulders large enough to obtain one 5.5" x 5.5" x 2.5" slab from each # OF SPECIMENS: 5 if same rock type; 8 if different rock types	D5240	Percent material lost during testing	Helps evaluate the soundness of rock for erosion control by effects of a sodium or magnesium sulfate solution. This accelerated weathering test simulates freezing and thawing of cold weather exposure.
ELASTIC MODULI OF ROCK IN TRIAXIAL COMPRESSION MIN SAMPLE SIZE: Length of core = (2-2.5 x diameter of core) + 1-2" # OF SPECIMENS: 1 specimen per confining stress	D7012B	Bulk density, peak shear stress, peak compressive stress, Young's Modulus, Poisson's Ratio, failure mode	Used to simulate the stress conditions of underground rock. Axial and lateral deformation are also measured and used to produce stress-strain curves and determine the elastic constants. If tests are run at multiple confining stresses, friction angle, and cohesion value can be determined.
ELASTIC MODULI OF ROCK IN UNIAXIAL COMPRESSION MIN SAMPLE SIZE: Length of core = (2-2.5 x diameter of core) + 1-2" # OF SPECIMENS: 1 specimen	D7012D	Compressive strength of rock, Young's Modulus, Poisson's Ratio, density, failure mode	Uniaxial compressive strength of rock is used in many design formulas and results are used to select excavation technique. With this method, axial and lateral deformation are also measured and used to produce stress-strain curves and determine the elastic constants.
MOH'S HARDNESS MIN SAMPLE SIZE: Length of core = 1-2" # OF SPECIMENS: 1 specimen	GTX-RC102	Moh's hardness value	Surface hardness of rock based on known mineral hardness scale.

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PERMEABILITY BY FLOWING AIR MIN SAMPLE SIZE: Length of core = 2-3" # OF SPECIMENS: 1 specimen	D4525	Permeability of rock to pressurized air	Method measures the permeability of rock to varying air pressures. Three air permeability values are determined and used to determine the equivalent permeability value for liquids.
PETROGRAPHIC ANALYSIS MIN SAMPLE SIZE: Length of core = 1-2" # OF SPECIMENS: 1 specimen	ISRM	Mineralogy of rock provided	A microscopic analysis of the rock with minerals identified.
POINT LOAD INDEX MIN SAMPLE SIZE: Axial: Length of core = 1 x diameter of core; Diametral: Length of core = (1.0 x diameter of core) + 0.25" # OF SPECIMENS: Up to 10 specimens	D5731	Failure load, estimated compressive strength	The point load strength test is used as an index test for strength classification of rocks using conical platens. It is commonly used to estimate uniaxial compressive strength.
PULSE VELOCITIES & ULTRASONIC ELASTIC CONSTANTS MIN SAMPLE SIZE: Length of core = (2-2.5 x diameter of core) + 1-2" # OF SPECIMENS: 1 specimen	D2845	P-wave & S-wave velocity, Poisson's Ratio, Young's Modulus	Compression and shear wave velocities are measured and used to determine elastic constants.
PUNCH PENETRATION MIN SAMPLE SIZE: Length of core = 3" # OF SPECIMENS: 1 specimen	Handwith	Peak slope index, maximum load, force-penetration curve	Simulates how material will fail using button and disk cutter bits.
ROCK QUALITY DESIGNATION MIN SAMPLE SIZE: Typically 5' of a core run # OF SPECIMENS: 1 specimen	D6032	RQD value for given material	Measures the percentage of intact and sound rock retrieved from a borehole. Basic component of many rock mass classification systems. Used as an indicator of low-quality rock zones.
SCHMIDT HAMMER MIN SAMPLE SIZE: Length of core = 6" # OF SPECIMENS: 1 specimen	D5873	Schmidt hardness number	The method provides rapid classification of the hardness of rock.
SLAKE DURABILITY MIN SAMPLE SIZE: Length of core = 10-12" or at least 2,000 grams of coarse aggregate # OF SPECIMENS: 1 specimen	D4644	Slake durability index	Measures the deterioration (slaking) of rock by exposing it to cycles of wetting and drying with abrasion.
SPLITTING (Indirect or Brazilian) TENSILE STRENGTH MIN SAMPLE SIZE: Length of core = 0.2-0.75 x diameter of core # OF SPECIMENS: Up to 10 specimens	D3967	Indirect tensile strength	Can be used as an easier and less expensive alternative to the direct tensile strength.
TABER ABRASION MIN SAMPLE SIZE: Length of core = 2-4" # OF SPECIMENS: 1 specimen	Tarkoy	Taber abrasion value	Used to assess the abrasiveness of rock for mechanical excavation. Rock abrasiveness governs the performance of disc cutters, the rate of its replacement, and subsequent tunnel costs.
TOTAL HARDNESS MIN SAMPLE SIZE: Length of core = 6-8" # OF SPECIMENS: 1 specimen	ISRM & Tarkoy	Taber abrasion value and Schmidt hardness number	Used to predict advance rates using a combination of rock hardness and abrasivity properties.
UNDRAINED TRIAXIAL COMPRESSION STRENGTH OF ROCK MIN SAMPLE SIZE: Length of core = (2-2.5 x diameter of core) + 1-2" per confining stress # OF SPECIMENS: 1 specimen per confining stress	D7012A	Bulk density, peak shear stress, peak compressive stress, failure mode	Commonly used to simulate stress conditions of underground rock. Tests run at multiple confining stresses can determine the friction angle and cohesion value.
UNCONFINED COMPRESSIVE STRENGTH OF ROCK MIN SAMPLE SIZE: Length of core = (2-2.5 x diameter of core) + 1-2" # OF SPECIMENS: 1 specimen	D7012C	Compressive strength of rock, density, failure mode	Uniaxial compressive strength of rock is used in many design formulas and results are used to select excavation technique.
UNIT WEIGHT, POROSITY AND SPECIFIC GRAVITY MIN SAMPLE SIZE: Length of core = 3-5" # OF SPECIMENS: 1 specimen	ISRM	Unit weight, porosity, and specific gravity	Determines basic index properties of rock.