[Calculation Method of CAI according to ASTM D7625]

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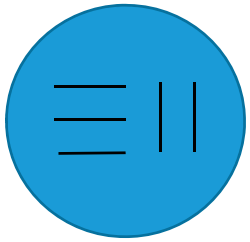
No.	Items	Requirements of ASTM D7625	Remarks
1	**1. Scope**	**1.3** The Rockwell Hardness (HR) of the stylus can have a profound effect on the results. The focus of this test method is an HRC value of 55 for every test (1, 2). However, there are situations where styli with different Rockwell Hardness can be used. Therefore, this test method includes discussions on stylus with different Rockwell Hardness.	Using of stylus of HRC55.
2	**4. Summary of Test Method**	**4.1** A steel stylus having a 90 degree conical tip with its axis perpendicular, and in contact with a rock surface, under a total constant force of 70 N, is scratched in a direction parallel to the rock surface over a distance of 10 mm.	Testing envirement
		4.2 After the test, width of the wear flatness is measured on stylus tip surface in units of 0.1 mm and number of units reported as the CERCHAR Abrasiveness Index, 0.1mm (= 1CAI).	Width of the wear flatness after the test, 1 CAI = 0.1 mm
		4.3 Five individual CA tests shall be conducted for each rock specimen to achieve a defined average value. on specimen, then a set of three parallel tests in one direction, and two more perpendicular to first set shall be done. 	Number of CAI tests per specimen (Five scratch tests using five styluses: three (3) parallel and two (2) perpendicular)

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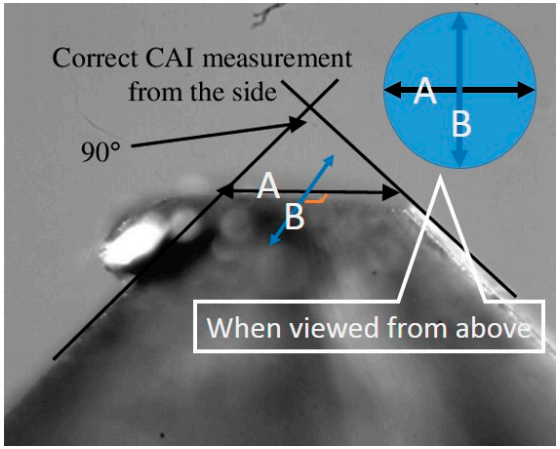
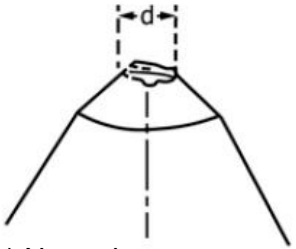
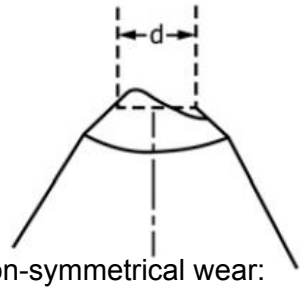
3	**9. Procedure**	**9.6** The tested stylus is removed from the apparatus and two perpendicular diameters of the abraded flat area of the stylus are measured under a microscope in 0.1 mm increments to an accuracy of 0.01 mm and recorded based on the observations and suggested action noted in Fig.4.  **9.7** The test is repeated 5 times, each time with a new/ refurbished stylus on a new scratch location of the rock surface.	Measurement of the flattened area of worn stylus tips under a microscope (diameters A and B) One stylus per scratch test (A total of five (5) styluses were used, as already mentioned in Section 4.3)
4	**Fig 4. Sketch of Abraded Shape of Extremity of Stylus After Testing Under a Microscope**	 (a) Normal wear: d = 0.1 mm C.A.I. =1  (b) Non-symmetrical wear: measurements still possible as an average of the values in two sides.  (c) Very rough surface of the test sample. Measurement of such a pin should be in-correct. A remake of the test is suitable.	Only figures (a) and (b) are applicable

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5	**10. Calculation and Interpretation of Results)**	**10.1** The arithmetic average of ten width of the wear flat of the stylus tip recorded in 9.6 and 9.7 (two perpendicular diameters of the abraded flat area for each of five used stylus), recorded as d_{avg}.	For diameters A and B of the five (5) styluses used (one per scratch test), calculate the arithmetic mean of the total ten (10) diameters, denoted as d_{avg}.
		10.2 The initial CERCHAR Abrasiveness Index *ICAI* is calculated using Eq 1: $ICAI = d_{avg} \times 10$ (1) **10.3** For test on natural rough surface using stylus tip with HRC of 55, the *ICAI* calculated in 10.2 = the *CAI* $ICAI = CAI$	

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		10.6 The CAI classification shall be determined from Table 1 based on the *CAI* index for a stylus tip hardness of 55 RHC.	

TABLE 1 Criteria for the CERCHAR Abrasiveness Index

Classification	Average CAI (HRC=55)
Very low abrasiveness	0.30–0.50
Low abrasiveness	0.50–1.00
Medium abrasiveness	1.00–2.00
High abrasiveness	2.00–4.00
Extreme abrasiveness	4.00–6.00
Quartzite	6.0–7.0