National Bureau of Standards

Certificate

Standard Reference Material 1857

Tool Steel Abrasive Wear Standard

This Standard Reference Material is intended for use with the dry sand/rubber wheel abrasion wear method as described in ASTM Standard Practice G65-81, Procedure A. Abrasive wear tests were made on 19 randomly selected specimens of this material according to the ASTM test method using the following specific conditions:

Applied Normal Load	= 133 N
Sliding Distance	= 4309 m
Sliding Speed	= 2.39 ± 0.01 m/s
Wheel Rubber Hardness @ 22 °C	= 59 ± 1 Durometer A, 5 s dwell
Minimum Time Interval Between Tests with Same Wheel	= 4 h
Ambient Temperature	= 22 ± 1 °C
Ambient Relative Humidity	= 25 to 40%
Sand Flow Rate	= 298 ± 4 g/min
Sand Type (See caution statement)	A.F.S. 50-70 test sand

Based on the results of these tests, SRM 1857 is certified for a wear-mass loss of 0.324 ± 0.030 g.

The uncertainty is the standard deviation of the 19 tests. The use of test conditions different from those given above may lead to a wear-mass loss much different from that certified.

Two tests may be carried out on each 25-mm by 76-mm face for a total of four tests per specimen. Additional tests may be conducted on each specimen after refinishing the faces. Refinishing consists of surface grinding to a depth below any previous wear scar. However, the final surface roughness must be less than 0.8 μm R_a and grinding must not alter the metallurgical structure and hardness of the material.

Preparation of specimens and the technical measurements leading to certification were directed and coordinated by L.K. Ives and A.W. Ruff with the assistance of F. Matanzo, and wear-mass loss tests were conducted by P.A. Boyer all of the Metallurgy Division, Center for Materials Science.

Statistical evaluation of the data was performed by J. Mandel of the National Measurement Laboratory.

The technical and support aspects involved in the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by R.K. Kirby.

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George A. Uriano, Chief
Office of Standard Reference Materials

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Supplementary Information

SRM 1857 is fabricated from AISI D2 tool steel. The 7.8-mm thick by 25-mm wide by 76-mm long specimens were prepared from a single lot of mill-annealed 26-mm square bar stock obtained from Carpenter Technology Corp., Reading, Pa., through Raymond Hemphill. After machining to approximate dimensions, the specimens were heat treated to a final hardness of 61 HRC by Carpenter Technology Corp. The 25-mm wide by 76-mm long test faces were surface ground at NBS to a finish of less than 0.8 μm R_a (measured perpendicular to the grinding direction).

Three rubber wheels were used alternately in the test series to determine the wear-mass loss. The rubber used in fabricating each wheel was compounded from a single batch of material and the rubber hardness was approximately the same for all wheels (59 $\pm$ 1 Durometer A, 5 s dwell). A period of at least 4 hours was allowed to elapse before reusing a given wheel.

Sufficient sand for the entire test series was mixed in a dual cone blender to ensure uniformity. The sand was stored under the same ambient conditions of temperature and humidity that existed during testing. The sand, designated A.F.S. 50-70 test sand, was obtained from the Ottawa Silica Company, Ottawa, Ill. It is a naturally occurring material as distinct from a synthetic or crushed product. Its properties are considered to be consistent with respect to performance in the dry sand/rubber wheel test. *Sand from a different soure or of a different type cannot be considered to be equivalent for the purpose of this test.*

The wear-mass loss was determined from the difference between specimen-mass before and after the test. Each test consisted of 6000 revolutions of the rubber wheel as specified in ASTM G65, Procedure A. A linear extrapolation was applied to the measured specimen wear-mass loss to obtain an effective wear-mass loss for a total sliding distance of 4309 m. This adjustment accounts for the difference between actual wheel diameter and the nominal value of 228.6 mm. The mass loss correction in all cases was less than 2%. An equivalent volume-wear loss (42.3 mm^3) may be determined by dividing mass loss by specimen density (7.66 g/cm^3). This value of the density was determined by Richard Davis of the NBS Length and Mass Measurements and Standards Division, Center for Absolute Physical Quantities.