U. S. Department of Commerce
Malcolm Baldrige
Secretary

National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards

Certificate of Analysis

Standard Reference Material 1227

Basic Open-Hearth Steel, 1% Carbon

(In cooperation with the American Society for Testing and Materials)

This Standard Reference Material is in the form of disks approximately 32 mm (1 1/4 in) in diameter and 19 mm (3/4 in) thick, intended for use in optical emission and x-ray spectrometric methods of analysis.

Element	Certified Value,[1] % by wt.	Estimated Uncertainty[2,3] % by wt.
Carbon	0.97	0.01
Manganese	.402	.007
Phosphorus	.014	.003
Sulfur	.026	.002
Silicon	.215	.004
Copper	.006	.002
Nickel	.007	.001
Chromium	.019	.003
Vanadium	.002	.001
Molybdenum	.003	.001
Cobalt	.003	.001

[1] The certified value listed for a constituent is the present best estimate of the "true" value based on the results of the cooperative program for certification.

[2] The estimated uncertainty listed for a constituent is based on judgment and represents an evaluation of the combined effects of method imprecision, possible systematic errors among methods, and gross sample variability ($\geq$ 1g). (No attempt was made to derive exact statistical measures of imprecision.)

[3] Some heterogeneity, especially for carbon, was observed using optical emission methods of analysis. It is thought that these heterogeneities are associated with the small amount of material examined during each exposure. If the SRM user employs a similar technique using small portions of the SRM, ($<<$0.1g), then sample variability similar to that shown in the table on the reverse side may be observed. The total uncertainty should include both the uncertainty due to the certified value and the uncertainty due to using a small sample.

Metallurgical Condition: The structure of the specimens is that resulting from hot working, followed by annealing.

The overall coordination of the technical measurements leading to certification was performed under the direction of J.I. Shultz, Research Associate, ASTM-NBS Research Associate Program.

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.E. Michaelis and W.P. Reed.

Washington, D.C. 20234
March 30, 1983

George A. Uriano, Chief
Office of Standard Reference Materials

(over)

PLANNING, PREPARATION, TESTING, ANALYSIS: This material is one of five aluminum-base "Benchmark" materials being prepared in a cooperative Industry-ASTM-NBS program. SRM's 1258 (Alloy 6011, Modified) and 1259 (Alloy 7075) are issued as wrought disks 35 mm (1 3/8 in) in diameter. Proposed SRM's C1255 (Casting Alloy 356) and C1256 (Casting Alloy A 380) are to be issued as cast disks 64 mm (2 1/2 in) in diameter, and proposed SRM 1257 (High-Purity) is to be issued as disks 38 mm (1 1/2 in) in diameter.

SRM 1259 was prepared under contract with NBS by the Aluminum Company of America, Alcoa Center, Pa., coordinated by D. J. Levin. The material was melted to composition and continuously cast into three ingots, 13.7 cm (5 3/8 in) in diameter and about 330 cm (130 in) long. After cropping the ends and obtaining slices for homogeneity testing, each ingot was cut into four cylinders, 61.0 cm (24 in) long; these were scalped to 11.6 cm (4 9/16 in) in diameter. The cylinders were center-bored (3.7 cm diameter) and then sawed lengthwise into three pieces (one half-round and two quarter-round sections.)

Selected half-round sections were forge-rolled and annealed at the Naval Research Laboratory, Washington, D.C., by T. Kissilnitkie. The material was processed to finished specimens at NBS.

Homogeneity testing was performed on both cast and finished specimens using optical emission spectrometry at the Aluminum Company of America, Alcoa Center, Pa., D. J. Levin; at the Reynolds Research Laboratory, Richmond, Va., N. Christ; and at NBS, J. A. Norris.

Specimens representative of the accepted lot of material were chipped and blended to form a composite sample and portions were distributed for chemical analyses leading to certification.

Cooperative analyses for certification were performed in the following laboratories:

Aluminum Company of America, Alcoa Technical Center, Alcoa Center, Pennsylvania; R. C. Obbink.

Aluminum Company of Canada, Ltd., Arvida, Quebec, Canada; L. Girolami.

Kaiser Aluminum and Chemical Corporation, Pleasanton, California; H. J. Seim, R. C. Calkins, G. M. Calkins, R. C. Kinne, and J. R. Skarset.

Kaiser Aluminum and Chemical Corporation, Ravenswood, West Virginia; M. E. Reed.

National Bureau of Standards, Washington, D.C.; R. W. Burke, T. J. Brady, E. R. Deardorff, B. I. Diamondstone, M. S. Epstein, S. Hanamura, J. D. Messman, T. C. Rains, and S. A. Wicks.

Reynolds Aluminum, Reynolds Metals Company, Richmond, Virginia; W. E. Pilgrim.

Elements other than those certified may be present in this material as indicated below. These are *not certified,* but are given as additional information on the composition.

Element	Concentration % by weight
Ga	(0.022)
*Ti	(.04)

*Not sufficiently homogeneous for certification

CAUTION: Accurate determinations of copper, magnesium, and zinc in the 6000 and 7000 aluminum-base alloys by standard ASTM optical emission methods of analysis are extremely sensitive to the metallurgical condition of the samples. Significantly large differences can be expected when wrought samples are compared to cast samples; however, small differences also may occur among wrought samples depending on the temperature and amount of working, and annealing and/or tempering operations. (Differences among cast samples may occur depending on the rate and type of solidification from the molten metal). This SRM is in the worked and fully annealed condition and is directly applicable to the analysis of samples in this same metallurgical condition.

X-ray fluorescence methods of analysis for the 6000 and 7000 aluminum-base alloys are normally not sensitive to the metallurgical condition of the samples.

The overall coordination of the technical measurements leading to certification were performed under the direction of J. I. Shultz, Research Associate, ASTM-NBS Research Associate Program.

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. E. Michaelis and R. Alvarez.