U. S. Department of Commerce
Malcolm Baldrige
Secretary

National Bureau of Standards
Ernest Ambler, Director

Certificate of Analysis

Standard Reference Materials 1159, 1160
Electronic and Magnetic Alloy Standards

Element	SRM 1159	SRM 1160
	Percent (by weight)	
Carbon	0.007	0.019
Manganese	$.30_5$	$.55_0$
Phosphorus	.003	.003
Sulfur	.003	.001
Silicon	.32	.37
Copper	.038	.021
Nickel	48.2	80.3
Chromium	0.06	0.05
Molybdenum	$.01_0$	4.3_5
Cobalt	.022	0.054
Iron	51.0	14.3

Samples are 1¼ in (3.1 cm) in diameter and ¾ in (1.9 cm) thick, and are issued in the annealed condition.

The analytical value listed for an element is the present best estimate of the true value based on the results of the cooperative analytical program. The analytical value is not expected to deviate from the true value by more than ± 1 in the last significant figure reported; for subscript figures, the deviation is not expected to be more than ± 5 in the subscript figure.

The material for the standards was prepared in a vacuum induction furnace at The Carpenter Steel Company, Reading, Pennsylvania, and supplied to NBS in the final form following a scheme of fabrication designed to produce material of the highest possible homogeneity.

Homogeneity testing was performed at NBS by D. M. Bouchette, S. D. Rasberry, and J. L. Weber, Jr., and was found to be satisfactory for the elements certified.

Cooperating with NBS in the analytical program were the following: Armco Steel Corporation, Research and Technology, Middletown, Ohio; Falconbridge Nickel Mines, Limited, Metallurgical Laboratories, Thornhill, Ontario, Canada; The Carpenter Steel Company, Metallurgical Department, Reading, Pennsylvania; and Westinghouse Electric Corporation, Research and Development Center, Pittsburgh, Pennsylvania.

The overall direction and coordination of the technical measurements leading to certification were performed under the chairmanship of B. F. Scribner.

The technical and support aspects involved in the preparation, certification, and issuance of these Standard Reference Materials were coordinated through the Office of Standard Reference Materials by R. E. Michaelis.

Washington, D.C. 20234
August 4, 1981
(Revision of Certificate dated
2-18-69)

George A. Uriano, Chief
Office of Standard Reference Materials

PLANNING, PREPARATION, TESTING, ANALYSIS: These standards are made available as a result of the cooperative program among the National Bureau of Standards, the American Cast Iron Pipe Company, the Ductile Iron Society, and the General Motors Corporation.

The material for the standards was melted and cast at the American Cast Iron Pipe Company, Birmingham, Alabama, with use of the NBS chill-cast mold assembly. The preparation and homogeneity testing plan was similar to that described in NBS Misc. Publ. 260-1, Standard Reference Materials: Preparation of NBS White Cast Iron Spectrochemical Standards, Robert E. Michaelis and LeRoy L. Wyman, June 19, 1964.

Homogeneity testing was performed at the Research Laboratories, General Motors Corporation, Warren, Michigan, by A. C. Ottolini under the direction of M.D. Cooper.

Cooperative analyses for certification were performed by members of the Ductile Iron Society under the direction and coordination of W.R. Kennedy, American Cast Iron Pipe Company, Birmingham, Alabama. Cooperating in the program were R.E. Deas and R.N. Smith, American Cast Iron Pipe Company, Birmingham, Alabama; F.R. Bryan, Ford Motor Company, Detroit, Michigan; C.M. Davis and C.H. Albright, International Nickel Company, Inc., Suffern, N.Y.; and C.P. Gaskill, U.S. Pipe and Foundry Company, Burlington, New Jersey.

Analyses for final certification at the National Bureau of Standards were performed in the laboratories of the Analytical Chemistry Division by D.A. Becker, B.B. Bendigo, D.M. Bouchette, E.L. Garner, T.D. Gills, W.D. Kinard, P.D. LaFleur, E. June Maienthal, J.S. McKay, Jr., T.J. Murphy S.D. Rasberry, W.R. Shields, and J.L. Weber Jr.

Technical measurements at NBS for final certification were coordinated by J.I. Shultz and J.L. Weber, Jr., under the chairmanship of B.F. Scribner.

The technical and support aspects involved in the preparation, certification, and issuance of these Standard Reference Materials were coordinated through the Office of Standard Reference Materials by R.E. Michaelis.

CAUTIONS:

1. Determinations made on other than the chill-cast or test surface are not recommended because of the unidirectional solidification structure.

2. These chill-cast standards are designed for calibration in the analysis of samples prepared in the same manner; samples prepared by other casting techniques or having other than a white structure may result in considerable bias.

3. Because the samples exhibit a change with respect to the columnar structure, both among standards and from bottom to top of the certified portion of the samples, the surface preparation for x-ray spectroscopic analysis may be critical. (A metallographic polishing technique is recommended.)

4. Because of the poor heat conductivity of the white irons, difference in volatility rates for certain elements in emission spectroscopic analysis may occur depending on the location of the burn and the source parameters. Sample and standard should be handled in the same way with respect to location of the burn.