National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material C1173a

Cast Steel 3

(In Cooperation with the American Society for Testing and Materials and the Steel Founders' Society of America)

This Standard Reference Material (SRM) 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]
Carbon	0.437	0.005
Manganese	.234	.005
Phosphorus	.030	.001
Sulfur	.092	.003
Silicon	1.35	.01
Copper	0.205	.003
Nickel	4.02	.04
Chromium	2.66	.03
Vanadium	0.42	.01
Molybdenum	1.46	.02
Titanium	0.024	.002

[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 material variability. No attempt was made to derive exact statistical measures of imprecision because several methods were involved in the determination of most constituents.

METALLURGICAL CONDITION: The specimens were chill cast by a rapid unidirectional solidification technique.

CERTIFIED PORTION: The certified portion for each specimen is that extending upward 16 mm (5/8 in) from the chill cast or test surface (the largest surface opposite the numbered surface). Only this portion was analyzed in the cooperative program for certification.

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

July 3, 1989
Gaithersburg, MD 20899
(Revision of certificate dated 2-24-81)

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

(Over)

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.

PLANNING, PREPARATION, TESTING, ANALYSIS:

The material for this standard was melted and cast at Esco Corporation, Portland, Oregon, L.E. Finch, under an NIST contract with the Steel Founders' Society of America (SFSA). A massive water-cooled, copper-plate mold assembly made by Esco for the SFSA was used in the preparation of the chill-castings. The preparation and plan for homogeneity testing 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.

Extensive homogeneity testing was carried out at the National Institute of Standards & Technology by metallographic studies, C.H. Brady; by optical emission analysis, J.A. Norris; and by x-ray fluorescence analysis, P.A. Pella.

Composite samples for chemical analyses were prepared in the form of millings cut from the certified portion of representative specimens of the lot of chill castings.

Cooperative analyses for certification, carried out under the auspices of the ASTM/NIST Research Associate Program, were performed in the following analytical laboratories.

Bethlehem Steel Corporation, Bethlehem, Pennsylvania, D.A. Flinchbaugh and J.L. Fernandez.

Copperweld Steel Co., Warren, Ohio, M.M. Hosler and A. Selak.

Inland Steel Company, East Chicago, Indiana, J.E. Joyce.

National Institute of Standards & Technology, Inorganic Analytical Research Division, B.I. Diamondstone and R.K. Bell, ASTM/NIST Assistant Research Associate.

Stelco, The Steel Company of Canada, Ltd., Hamilton, Ontario, Canada, O.P. Bhargave.

CAUTIONS:

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

2. This chill-cast SRM is designed for calibration in the analysis of samples prepared in the same general manner; samples prepared by other casting techniques or having different metallurgical conditions may exhibit a bias in the results.

Additional elements were determined in the cooperative analytical program. Although NOT CERTIFIED, the approximate values are given below:

SRM No.	C1173a
Element	Percent by Weight
Aluminum	(0.005)
Arsenic	(.02)
Boron	(.0005)
Lead	(.0006)
Niobium	(0.05)
Zirconium	(.01)
Cobalt	(0.06)