

# Certificate of Analysis

## STANDARD REFERENCE MATERIALS

### 1138 and 1139

### Cast Steel Standards

SRM No.	1138 Cast Steel 1	1139 Cast Steel 2
Element	Percent by Weight	
Carbon	0.12 <sub>0</sub>	0.79 <sub>2</sub>
Manganese	.43 <sub>0</sub>	[.96] <sup>a</sup>
Phosphorus	.053	.011
Sulfur	.053	.013
Silicon	.35	.84
Copper	.10	.40
Nickel	.10 <sub>0</sub>	.91
Chromium	.12 <sub>0</sub>	1.97
Vanadium	.020	0.23
Molybdenum	.050	.51

<sup>a</sup>Considerable variation was encountered in the chemical determination of the manganese content in the chipped composite sample precluding final certification. However, the solid certified portion of the samples exhibits satisfactory homogeneity for manganese for application in optical emission and x-ray spectrochemical analysis. The value of 0.96% Mn is the best estimate of the concentration.

**SIZE AND METALLURGICAL CONDITION:** Samples are approximately 1 1/4 inches (3.2 cm) square and 1/2 inch (1.3 cm) thick; they were chill-cast by a rapid unidirectional solidification technique.

**CERTIFIED PORTION:** The certified portion for each sample is that extending upward 5/16 inch (0.8 cm) from the chill-cast or test surface (the largest surface opposite the numbered surface). This portion only was analyzed in the cooperative program for certification.

**FINAL CERTIFICATION:** The value listed for an element is the best estimate of the true value based on the results of the cooperative analytical program. The value listed is not expected to deviate from the true value by more than  $\pm 1$  in the last significant figure reported; for a subscript figure, the deviation is not expected to be more than  $\pm 5$ . Based on the results of homogeneity testing, maximum variations within and among samples are estimated less than the accuracy figures given above.

Washington, D. C. 20234  
July 13, 1970

J. Paul Cali, Acting Chief  
Office of Standard Reference Materials

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**PLANNING, PREPARATION, TESTING, ANALYSIS:** The two cast steel standards are made available as a result of a cooperative program between the Steel Founders' Society of America and the National Bureau of Standards.

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 was similar to that described in NBS Misc. Publ. 260-1, Standard Reference Materials: Preparation of NBS White Cast Iron Spectrochemical Standards, R. E. Michaelis and L. L. Wyman, June 19, 1964.

Homogeneity testing was performed by chemical, optical emission, and x-ray analyses, or combinations thereof, at the National Bureau of Standards, the Research Laboratories of the General Motors Corporation, and the following member foundries of the Steel Founders' Society of America:

General Metals Corporation, California  
The Massillon Steel Castings Company, Ohio  
Lebanon Steel Foundry, Pennsylvania  
The Duriron Company, Inc., Ohio  
American Steel Foundries, Inc., Indiana  
Esco Corporation, Oregon  
Shenango-Penn, Ohio  
Minneapolis Electric Steel Castings Company, Minnesota  
Ross-Meehan Foundries, Tennessee  
Empire Steel Castings, Inc., Pennsylvania

Chemical analyses for certification were made on representative samples for each standard at the National Bureau of Standards and the following member foundries of the American Steel Founders' Society of America:

Minneapolis Electric Steel Castings Company, Minnesota  
Esco Corporation, Oregon  
Electric Steel Castings, Inc., Texas  
Symington Wayne Corporation, New York  
American Steel Foundries, Inc., Indiana

Technical Measurements at NBS for 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 general manner; samples prepared by other casting techniques or having different metallurgical condition may exhibit a bias in the results.