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 1286

Low Alloy Steel (HY 80)

(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 fluorescence spectrometric methods of analysis.

Constituent	Certified Value,[1] Percent by Weight	Estimated Uncertainty[2]
Carbon	0.196	0.004
Manganese	.152	.003
Phosphorus	.008	.001
Sulfur	.017	.001
Silicon	.130	.004
Copper	.043	.003
Nickel	2.81	.02
Chromium	1.53	.01
Vanadium	0.0057	.0004
Molybdenum	.344	.002
Cobalt	.116	.001
Aluminum (Total)	.109	.004
Titanium	.040	.002
Arsenic	.019	.003
Tin	.012	.003

[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 judgement 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 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.

Washington, D.C. 20234
June 8, 1982

George A. Uriano, Chief
Office of Standard Reference Materials

(over)

PLANNING, PREPARATION, TESTING, ANALYSIS:

The material for this SRM was melted and cast into a single ingot at Esco Corporation, Portland, Oregon (L.E. Finch). The single ingot was fabricated at the Puget Sound Naval Shipyard, Bremerton, Washington (G. Foltz). The ingot was first forged to a slab; then portions of suspected inhomogeneity were cut to discard (5% corresponding to the ingot bottom, 15% from the top, and 25% from the center lengthwise). The remaining slab sections were forged and swaged to rods oversize 32 mm in diameter, sub-critical annealed, and centerless ground to the final size of 32 mm diameter.

Extensive homogeneity testing was carried out at NBS by optical emission analysis, J.A. Norris; by x-ray fluorescence analysis, P.A. Pella; by chemical analysis, B.I. Diamondstone, and by R.K. Bell, ASTM-NBS Research Associate Program.

Composite samples for chemical analyses were prepared in the form of millings, cut from the full cross section of specimens representative of the entire lot of material.

Cooperative analyses for certification, carried out under the auspices of the ASTM-NBS Research Associate Program, were performed in the following laboratories:

General Dynamics, Electric Boat Division, Groton, Conn., E.H. Frank.

Inland Steel Co., Indiana Harbor Works, East Chicago, Ind., J.E. Joyce.

Lukens Steel Co., Coatesville, Pa., J.H. Morris, E. Gilbert, S. Forese, and J. Kishel.

National Bureau of Standards, Inorganic Analytical Research Division, B.I. Diamondstone, and by R.K. Bell, ASTM-NBS Research Associate Program.

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

Constituent	Non-Certified Value, Percent by Weight
Boron	(0.006)
Lead	(.0002)
Niobium	(.012)
Tungsten	(.013)
Zirconium	(.021)