



National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material® 33e

Nickel Steel

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

This Standard Reference Material (SRM) is in the form of chips sized between 0.50 and 1.18 mm sieve openings (35 and 16 mesh). SRM 33e is intended primarily for use in chemical methods of analysis.

Element	Analysts					Certified Value ¹ (Wt %)	Estimated Uncertainty ²
	1	2	3	4	5		
Carbon	0.186	0.190	0.184	0.185	0.187	0.186	0.004
Manganese	0.528 ^a		0.526	0.528	0.521 ^b 0.523	0.525	0.005
Phosphorus	0.005				0.005	0.005	0.001
Sulfur	0.009	0.010	0.010	0.009	0.009	0.009	0.001
Silicon	0.262		0.264	0.262	0.260	0.262	0.002
Copper	0.070 ^a		0.071 ^c		0.069 ^d	0.070	0.001
Nickel	3.34		3.34	3.41	3.37	3.36	0.04
Chromium	0.068 ^a		0.070 ^e		0.067 ^f	0.068	0.002
Molybdenum	0.222 ^a		0.220 ^g		0.230 ^{h,i}	0.224	0.006
Aluminum	0.030 ^a		0.031 ^c		0.028 ^j	0.030	0.002

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

²The estimated uncertainty listed for the constituent is based on judgment and represents an evaluation of the combined effects of method imprecision, possible systematic errors among methods, and material variability of samples of 0.5 g or more. (No attempt was made to derive exact statistical measures of imprecision because several methods were involved in the determination of most constituents.)

This Certificate of Analysis has undergone editorial review to reflect program and organizational changes at NIST and the Department of Commerce. No attempt has been made to reevaluate the certificate values or any other technical data presented on this certificate.

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

The technical and support aspects involved in the original preparation, certification, and issuance of this SRM were coordinated through the Office of Standard Reference Materials Program by W.P. Reed. Revision of this certificate was coordinated through the Standard Reference Materials Program by P.A. Lundberg.

Gaithersburg, MD 20899
March 15, 1995
(Revision of Certificate dated 11-26-84)

Thomas E. Gills, Chief
Standard Reference Materials Program

(over)

METHODS/TECHNIQUES

Combustion Infrared - Carbon, Sulfur
Persulfate - Arsenite
Photometric - Phosphorus
Perchloric Acid Dehydration - Silicon
Gravimetric - Nickel

- ^a Atomic absorption
- ^b Sodium bismuthate oxidation-arsenite titration
- ^c Optical emission spectroscopy
- ^d Neocuproine spectrophotometric method
- ^e Chromium separated from the bulk of the iron in a 10 g sample by NaHCO_3 hydrolysis, oxidized with peroxydisulfate and titrated potentiometrically with ferrous ammonium sulfate solution
- ^f HClO_4 oxidation- $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2$ - KMnO_4 titration
- ^g Alpha-benzoinoxime gravimetric method
- ^h Spectrophotometric method
- ⁱ Same value obtained by gravimetric method
- ^j Mercury cathode-8 hydroxyquinoline

PLANNING, PREPARATION, TESTING, ANALYSIS

The material for this standard was provided by The Timken Company, Canton, OH, through the courtesy of V.R. Chapman. Homogeneity testing was performed at the National Institute of Standards and Technology by J.A. Norris, optical emission analysis; D.E. Brown, and B.I. Diamondstone, chemical analysis, Analytical Chemistry Division and by R.K. Bell, ASTM/NIST Research Associate Program.

Cooperative analyses for certification were performed in the following laboratories:

Amax Metals Group, Research Laboratory, Ann Arbor, MI, R.C. Binns.

LTV Steel, Warren, OH, I. Shepler.

National Institute of Standards & Technology, Analytical Chemistry Division, Gaithersburg, MD, D.E. Brown, B.I. Diamondstone, and R.K. Bell, ASTM/NIST Research Associate Program.

Standard Steel Co., Burnham, PA, J. Arp.

The Timken Co., Canton, OH, N.J. Stecyk

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.

<u>Element</u>	<u>Concentration, Wt %</u>
Co	(0.06)
Ti	(0.001)
Sn	(0.002)
Zr	(0.001)
V	(0.001)