

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON 25, D.C.

National Bureau of Standards
Certificate of Analyses

Standard Sample 115A
Copper-Nickel-Chromium Cast Iron

ANALYST	C		Mn	P		S		Si	Cu	Ni	Cr	V	Mo	Ti
	Total	Graphitic	Persulfate-Arsenite	Gravimetric (weighed as Mg ₂ P ₂ O ₇ after removal of arsenic)	Alkali-Molybdate ^a	Gravimetric (direct oxidation and precipitation after reduction of iron)	Combustion Iodate titration	Perchloric acid dehydration		Weighted as nickel dimethylglyoxime	FeSO ₄ -KMnO ₄ titration		Colorimetric	H ₂ O ₂ -photometric
1.....	2.62 ^b	1.95 ^b	0.99 ^c	0.084 ^d	0.086 ^d	0.066 ^e	0.067 ^e	2.14 ^f	5.51 ^g	14.46 ^h	1.98 ⁱ	0.014 ^j	0.052 ^k	0.020 ^l
2.....	2.62 ^m	1.98 ^m	0.99 ⁿ	0.087 ⁿ		0.061 ^o		2.11 ^o	5.54 ^o	14.47 ^o	1.99 ^o	0.016 ^o	0.047 ^o	
3.....	2.64 ^p	1.95 ^p	1.01 ^p		0.089 ^p	0.061 ^p	0.062 ^p	2.15 ^p	5.53 ^p	14.51 ^p	1.94 ^p	0.014 ^p	0.049 ^p	0.019 ^p
4.....	2.62 ^q	1.94 ^q	1.00 ^q	0.084 ^q	0.084 ^q	0.067 ^q	0.067 ^q	2.16 ^q	5.51 ^q	14.50 ^q	1.97 ^q	0.014 ^q	0.054 ^q	0.020 ^q
5.....	2.60 ^r		1.01 ^r		0.089 ^r		0.062 ^r	2.11 ^r	5.54 ^r	14.51 ^r	2.01 ^r			
6.....	2.64 ^s	1.97 ^s	1.01 ^s		0.084 ^s		0.067 ^s	2.14 ^s	5.50 ^s	14.45 ^s	1.98 ^s		0.048 ^s	
7.....	2.62 ^t	1.99 ^t		0.089 ^t	0.085 ^t	0.063 ^t	0.066 ^t	2.09 ^t	5.49 ^t	14.51 ^t	1.99 ^t			
Average.....	2.62	1.96	1.00	0.086	0.086	0.064	0.065	2.13	5.52	14.49	1.98	0.014	0.050	0.020
General average.....	2.62	1.96	1.00	0.086		0.064		2.13	5.52	14.49	1.98	0.014	0.050	0.020

^a Precipitated at 40 °C, washed with a 1-percent solution of KNO₃, and titrated with alkali standardized by the use of acid potassium phthalate and the ratio 23 NaOH:1P.
^b Sample treated with HNO₃ (Sp. gr. 1.20), filtered and washed. Residue digested with HCl (Sp. gr. 1.19), filtered, washed, dried, and burned.
^c Potentiometric titration.
^d Molybdenum-blue photometric method. See J. Research NBS 26, 405 (1941) RP1386.
^e 1-g sample burned in oxygen at 1,450 °C, and sulfur dioxide absorbed in starch-iodide solution. Iodine liberated from iodide by titration, during the combustion, with standard KIO₃ solution. Titer based on 93 percent of the theoretical factor.
^f Double dehydration with intervening filtration.
^g H₂S-electrolytic method.

^h Nickel precipitated with dimethylglyoxime from an aliquot portion of a 2-g sample.
ⁱ Persulfate oxidation, potentiometric titration with FeSO₄.
^j Ether, mercury cathode, HNO₃ oxidation, potentiometric titration with FeSO₄.
^k Cupferron separation after solution of the sample in diluted HCl (1+2). Vanadium separated by treatment with NaOH.
^l Gasometric method.
^m KIO₄ photometric method.
ⁿ Weighed as ammonium phosphomolybdate.
^o Dimethylglyoxime-electrolytic method after removal of copper.
^p Spectrochemical determination.

^q Sulfur gases absorbed in NaOH-H₂O₂ solution and excess NaOH titrated with H₂SO₄.
^r H₂S-CuS-CuO.
^s Dimethylglyoxime-nickel oxide method.
^t Perchloric acid oxidation.
^u FeSO₄-(NH₄)₂S₂O₈-KMnO₄.
^v α-benzoinoxime-PbMoO₄ method.
^w Vanadium separated by Na₂CO₃ fusion.
^x Ether-cupferron separation on a 10-g sample. Vanadium determined by FeSO₄-(NH₄)₂S₂O₈-KMnO₄ method.
^y ZnO-Bismuthate method.
^z Perchloric acid oxidation, titration with FeSO₄-K₂Cr₂O₇.
^{aa} Bismuthate method.
^{ab} Titrating solution standardized by the use of a standard iron or steel.

List of Analysts

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| 1. Ferrous Laboratory, National Bureau of Standards. J. I. Shultz, in charge. Analysis by E. June Maienthal and T. W. Freeman. | 4. J. B. Armstrong, Bethlehem Steel Co., Sparrows Point Plant, Sparrows Point, Md. |
| 2. C. M. Davis, R. G. Lomell, and J. H. Haines, The International Nickel Co., Inc., Research Laboratory, Bayonne, N.J. | 5. C. K. Mitchell, Lehigh Testing Laboratories, Wilmington, Del. |
| 3. R. H. Elder and R. E. Deas, American Cast Iron Pipe Co., Birmingham, Ala. | 6. A. E. Schuh and G. P. Gaskill, United States Pipe and Foundry Co., Burlington, N.J. |
| | 7. J. Gurski, Ford Motor Co., Dearborn, Mich. |

The iron for the preparation of this standard was furnished by The International Nickel Co., Inc.

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A. V. ASTIN, *Director.*