

U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

OF

STANDARD SAMPLE 125

STEEL

(HIGH-SILICON)

ANALYST*	C	Mn	P		S		Si	COPPER H ₂ S-CuS-CuO	NICKEL Weighed as nickel dimethylglyoxime	CHROMIUM FeSO ₄ -KMnO ₄ titration	VANADIUM	MOLYBDENUM Colorimetric	ALUMINUM (total)	TITANIUM Colorimetric	TIN
	Direct combustion	Gravimetric (Weighed as Mn ₂ P ₂ O ₇ after removal of arsenic)	Alkali-molybdate ^a	Gravimetric (direct oxidation and final precipitation to reduced solution)	Evolution with HCl (1-1) ZnS-H ₂ S (theoretical sulfur titre) ^b	Sulfuric acid dehydration									
1	0.056	0.104 ^c	0.007	0.009	0.004	0.005	4.97 ^d	0.065 ^e	0.045	0.017	0.001	0.004	0.258 ^f	0.006	0.007 ^g
2	.055	.104 ^h	.008	.....	.003	.003	4.98 ⁱ	.060 ^e	.047	.019 ^k	.....	.....	.262 ^l	.007	.....
3	.055	.105 ^c	.009	.008	.006	.005 ^m	4.99 ⁿ	.061 ^o	.050	.014	.....	.....	.270 ^p	.....	.....
4	.062	.100 ^c	.010	.009 ^m	.005	.....	4.99	.074 ^e	.046	.016	.001	.004	.265 ^q	.....	.005 ^r
5	.063	.113 ^c	.011	.010 ^m	.002	.002 ^m	4.97 ^j	.....	.047	.016	.....	.....	.268 ^p	.005	.....
6	.057	.097 ^s	.009	.010	.005	.004	4.96 ^t	.....	.049	.020	.002	.003	.251 ^u	.....	.....
7	.059	.104 ^c	.008	.008	.007	.....	4.97	.....	.049	.014	.....	.....	.26 ^v	.....	.....
	.06	.099 ^c	.007	.008	.....	.003	4.97 ^j	.....	.043	.018	.....	.....	.25 ^w	.....	.....
	.063	.10 ^c	.009	.010	.006	.007	4.93 ^t	.068 ^e	.047	.015	.001	.003	.266 ^x	.005	.008 ^y
10	.055	.102 ^s	.006	.008	.002	.....	4.98	.065 ^e	.048	.017	.....	.003	.263 ^z	.007	.....
11	.057	.105 ^z	.....	.012	.006	.007	4.95 ^j	.067 ^e	.042 ^z	.016	.....	.002	.260 ^{aa}	.008	.008 ^{ab}
12	.054	.100 ^{ci}	.....	.009 ^m	.....	.004 ^m	5.00 ^j	.068 ^o	.046	.016	.....	.....	.257 ^{ad}	.....	.....
Averages	.058	.103	.008	.009	.005	.004	4.97	.066	.047	.017	.001	.003	.261	.006	.007
Recommended values	0.058	0.103	0.008	0.009	0.005	0.004	4.97	0.066	0.047	0.017	0.001	0.003	0.261	0.006	0.007

* Precipitated at 40° C., washed with a 1-percent solution of KNO₃ and titrated with alkali standardized by using the National Bureau of Standards Standard Sample of acid potassium phthalate and the ratio of 23 NaOH:1 P.
^b Value obtained by standardizing the titrating solution by means of sodium oxalate through KMnO₄ and Na₂S₂O₈.
^c Persulfate-arsenite method.
^d 2.5-g. sample. Double dehydration, silica ignited at 1,200° to 1,250° C.
^e Finished by electrolysis.
^f 10-g. sample dissolved in HCl-HNO₃. Silica removed by dehydrating and filtering. Residue ignited, treated with HF-H₂SO₄, nonvolatile fused with K₂S₂O₇, and the solution of the melt added to the ether-extracted acid portion of the silica filtrate. Aluminum precipitated with 8-hydroxyquinoline in an ammoniacal tartrate-cyanide solution. Precipitate filtered, treated with H₂SO₄-HNO₃ and aluminum precipitated with NH₄OH. Ignited Al₂O₃ corrected for SiO₂ and TiO₂.
^g Tin precipitated as sulfide in HNO₃ solution, etc., and finally reduced with lead and titrated with iodine. See NBS J. Research 8, 309 (1932) RP415.
^h Periodate, spectrophotometric. (See Ind. Eng. Chem., Anal. Ed. 10, 1 (1938).)
ⁱ Weighed as (NH₄)₂PO₄·12 MoO₃.
^j Perchloric acid dehydration.

^k Spectrophotometric.
^l Solution in HNO₃-HCl. Iron removed with ether. H₂S group removed and titanium and the like removed with cupferon. Aluminum and chromium precipitated as the basic benzoates, ignited and weighed as the oxides. Ignited oxide corrected for chromium.
^m Titrating solution standardized by the use of a standard steel.
ⁿ Nitric-hydrochloric-sulfuric acid dehydration.
^o Sulfide ignited, dissolved, and treated with KI and titrated with Na₂S₂O₈.
^p Solution in HCl-HNO₃-H₂SO₄. Iron and the like removed with the mercury cathode. Aluminum precipitated with NH₄OH, and weighed as Al₂O₃.
^q Iron removed with ether and NaOH. Aluminum precipitated with NH₄OH, and weighed as Al₂O₃.
^r Tin reduced with lead and antimony and titrated with iodine solution.
^s Bismuthate (FeSO₄-KMnO₄) method.
^t Nitric-sulfuric acid dehydration.
^u Iron removed with ether and NaOH, and aluminum precipitated and weighed as AlPO₄.
^v Aluminum precipitated twice as AlCl₃·6H₂O from ether-HCl solution (Gooch-Havens method), dissolved and precipitated with NH₄OH, and weighed as Al₂O₃.
^w Solution in diluted H₂SO₄. Iron removed with the mercury cathode. Titanium and the like removed with cupferon, and aluminum precipitated with NH₄OH.

Precipitate dissolved and aluminum precipitated as the quinolate, dried, and weighed.
^x Solution in diluted H₂SO₄(1+9). Aluminum precipitated by NaHCO₃. Precipitate filtered and dissolved in HCl. Iron and the like precipitated with NaOH, and aluminum precipitated and weighed as AlPO₄.
^y Tin precipitated as sulfide in nitric acid solution. Separated from copper by precipitation with NH₄OH. Reduced with metallic aluminum and titrated with KIO₃.
^z Iron removed with the mercury cathode. Titanium and the like precipitated with NaOH, and aluminum precipitated and weighed as AlPO₄.
^{aa} Titrated with standard KCN solution.
^{ab} Solution in H₂SO₄+HF. Aluminum precipitated with NaHCO₃. Precipitate filtered, dissolved, and iron and the like removed with the mercury cathode, and aluminum precipitated and weighed as AlPO₄.
^{ac} Tin precipitated as sulfide. Precipitate filtered, dissolved and tin precipitated with NH₄OH. Precipitate filtered, dissolved and tin precipitated as sulfide, ignited, and weighed as SnO₂.
^{ad} Solution in HCl. Aluminum precipitated twice as AlPO₄ from ammonium acetate-acetic acid buffered solution after reduction of iron with Na₂S₂O₄. Remainder of the iron removed by the mercury cathode and aluminum precipitated and weighed as AlPO₄.

*LIST OF ANALYSTS

1. Ferrous Laboratory, National Bureau of Standards; analysis by John L. Hague and Waino H. Jukkola.
2. S. E. Q. Ashley and W. M. Murray, Jr., General Electric Co., Pittsfield, Mass.
Allegheny Ludlum Steel Corporation, Brackenridge, Pa., C. A. Scharschu, in charge; analysis by D. P. Bartell.
3. W. E. Steiner, Bethlehem Steel Co., Cambria Plant, Johnstown, Pa.
4. M. H. Steinmetz, General Electric Co. Schenectady, N. Y.
5. H. E. Stocum, Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
6. W. A. Straw, Western Electric Co., Chicago, Ill.
7. B. L. Clarke, Bell Telephone Laboratories, New York, N. Y.
8. C. O. Geyer, Inland Steel Co., Indiana Harbor Works, East Chicago, Ind.
9. R. H. Wynne and E. W. Beiter, Westinghouse Electric and Manufacturing Company, Research Laboratories, East Pittsburgh, Pa.
10. C. Ruhe, Carnegie-Illinois Steel Corporation, Homestead Steel Works, Munhall, Pa.
11. E. L. Bush, Carnegie-Illinois Steel Corporation, Vandergrift Works, Vandergrift, Pa.

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LYMAN J. BRIGGS,
Director.