

DEPARTMENT OF COMMERCE

Bureau of Standards
Certificate of Analyses

OF

STANDARD SAMPLE No. 19b
ACID OPEN-HEARTH STEEL, 0.2% CARBON

ANALYST.	CARBON.	SILICON.		PHOSPHORUS.		SULPHUR.		MANGANESE.		COPPER (H ₂ S-CuS-CuO.)	NICKEL (weighed as nickel dimethylglyoxime).	CHROMIUM (FeSO ₄ -KMnO ₄ titration.)	ARSENIC.	VANADIUM.
	DIRECT COMBUSTION.	SULPHURIC ACID DEHYDRATION.	OTHER METHODS.	ALKALI MOLYBDATE.	GRAVIMETRIC (weighed as Mg ₂ P ₂ O ₇ after elimination of arsenic).	GRAVIMETRIC (Direct oxidation and final precipitation in reduced solution.)	EVOLUTION ZIN- IODINE (theoretical sulphur titre).	BISMUTHATE (FeSO ₄ -KMnO ₄).	OTHER METHODS.					
1	0.201	0.148		0.044	0.043	0.025	0.026	0.470		{0.022 .022 ^b }	0.115	0.022	{0.015 ^e .014 ^d }	None found
2	.200	.150		.043	.042	.025	.027	.469		.021	.119	.021 ^e		<.001 ^e
3	.203	.149		.045		.026			0.46 ^f	.020 ^g	.095 ^h	.024 ⁱ		
4	.21	.148		.046		.027		.45	.45 ^j	.021 ^b	.116 ^h			None found.
5	.201	.148	0.153 ^k	.042	.043 ^l	.024		.460	.470 ^j	.024				
6	.20	.139	.147 ^m	.045		{.024 ⁿ .026}	.024	.469	.469 ^j	.014	.112		.009 ^o	Trace.
7	.20	.145	.145 ^p	.043		.027 ⁿ	.025	.46	.46 ^j					
8	.205	.146	.145 ^p	.043 ^q		.026		.467		.015 ^r	.103	.018	.009 ^o	<.005
9	.197	.140		.043		.026		.459	.468 ^s	.026	.113			
10	.196	.146		.042		.023	.024	.45		.024				
11	.21	.15		.044		.024		.45	.46 ^s	.02				
12	.20		.14 ^p						.475 ^s	.02				
AVERAGE	.202	.146	.146	.044	.043	.025	.025	.460	.464	.021	.110	.021	.012	
GENERAL AVERAGE	.202	.146		.043		.025	.025	.462		.021	.110	.021	.012	

NOTE.—By the use of methods employing empirical titres for evolution sulphur an average of 0.026% was obtained by eight analysts. These values ranged from 0.021% to 0.030%.

^a Value obtained by standardization of titrating solution against sodium oxalate through KMnO₄ and Na₂S₂O₃.
^b Precipitated with H₂S and determined electrolytically.
^c Weighed as As₂S₃.
^d Converted the sulphide to arsenate, precipitated as Ag₃AsO₄, dissolved in HNO₃, and titrated with KCN₈.

^e Electrometric titration.
^f PbO₂-Na₂AsO₄.
^g Precipitation with ferricyanide and final titration with KCN.
^h Separation as nickel dimethylglyoxime, solution of the precipitate and titration with KCN.
ⁱ KMnO₄ oxidation.
^j Persulphate-arsenite.
^k Solution in HCl.

^l Weighed as (NH₄)₂PO₄. 12MoO₃.
^m Solution in HCl-HNO₃; dehydration with H₂SO₄.
ⁿ Precipitated in FeCl₃ solution.
^o Distillation as AsCl₃ and iodine titration.
^p Solution in HNO₃; dehydration with H₂SO₄.
^q Permanganate titration.
^r Na₂S₂O₃-CuS-CuO.
^s Bismuthate-arsenite.

INDEX TO ANALYSTS

- James I. Hoffman, Bureau of Standards.
- Routine Laboratory, Bureau of Standards, H. A. Bright in charge.
- C. M. Johnson, The Crucible Steel Company of America, Pittsburgh, Pa.
- John L. Harvey, Carnegie Steel Co., Pittsburgh, Pa.
- George W. Miller, Baldwin Locomotive Works, Philadelphia, Pa.
- Robert W. Hunt & Co., Chicago, Ill.
- H. E. Slocum, Jones & Laughlin Steel Co., Pittsburgh, Pa.
- Jerome Strauss, Naval Gun Factory, U. S. Navy Yard, Washington, D. C.
- V. E. Hillman, Crompton & Knowles Loom Works, Worcester, Mass.
- Welton J. Crook, Stanford University, Leland Stanford University, Calif.
- D. S. Perry, General Motors Corporation, Detroit, Mich.
- H. C. Parish, Arthur D. Little, Inc., Cambridge, Mass.

This standard is not recommended for colorimetric carbon determinations, because of uncertainty as to the condition of the carbon.

S. W. STRATTON,
Director.

Washington, D. C.

May 3, 1922.

GOVERNMENT PRINTING OFFICE.