U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

OF

STANDARD SAMPLE 19E

ACID OPEN-HEARTH STEEL, 0.2% CARBON

	C	Mn		P		S			Si								
*ANALYST**	*Direct combustion*	*Bismuthate ($FeSO_4$-$KMnO_4$)*	*Persulfate-Arsenite*	*Gravimetric (weighed as $Mg_2P_2O_7$ after removal of arsenic)*	*Alkali-Molybdate* [a]	*Gravimetric (direct oxidation and precipitation after reduction of iron)*	*Evolution with HCl (1-1) ZnS-Iodine (theoretical sulfur titre)* [b]	*Combustion*	*Sulfuric acid dehydration*	*COPPER H_2S-CuS-CuO*	*NICKEL Weighed as nickel dimethylglyoxime*	*CHROMIUM $FeSO_4$-$KMnO_4$ titration*	*VANADIUM*	*MOLYBDENUM Colorimetric*	*TIN*	
1	0. 197	0. 488	0. 491	0. 033	[c]0. 035	0. 029	0. 027	[d]0. 029	[e]0. 171	0. 167	0. 092	[f]0. 038	[g]0. 009	0. 012	[h]0. 010	
2	. 194		. 487	. 035	[i]. 034	. 031			. 163	[j]. 163	. 094	[k]. 038			[h]. 010	
3	. 202		. 490	. 031	. 032	. 031		[d]. 030	[e]. 171	. 174	. 088	. 037			[h]. 009	
4	. 193	. 482			[i]. 034	. 030	. 029	[d]. 029	. 179	[j]. 166	. 100	[l]. 040				
5	. 200		. 49	. 032	[m]. 034	. 031	[n]. 030	[o]. 031	[p]. 171	[q]. 166	. 094	[f]. 040			[r]. 010	
6	. 201	. 492	. 491	. 033	[c]. 034	. 032			[s]. 177	[t]. 160	. 091	. 038			[h]. 010	
7	. 196		. 495		[i]. 033	. 032		[d]. 030	[s]. 176	[u]. 168	[v]. 102	. 037				
8	. 192	[w]. 498	. 495	[x]. 035		. 031	[n]. 031	[d]. 030	[s,e]. 174	[j]. 165	. 083	[k]. 039			[h]. 012	
Averages	**0. 197**	**0. 490**	**0. 491**	**0. 033**	**0. 034**	**0. 031**	**0. 029**	**0. 030**	**0. 173**	**0. 166**	**0. 093**	**0. 038**	**0. 009**	**0. 012**	**0. 010**	
General average	**0. 197**	**0. 491**		**0. 033**		**0. 030**			**0. 173**	**0. 166**	**0. 093**	**0. 038**			**0. 010**	

[a] Precipitated at 40° C, washed with a 1-percent solution of KNO_3 and titrated with alkali standardized by the use of acid potassium phthalate and the ratio 23 NaOH:1P.

[b] Value obtained by standardizing the titrating solution by means of sodium oxalate through $KMnO_4$ and $Na_2S_2O_3$ and use of the ratio 2I:1S.

[c] Molybdenum-blue photometric method. See J. Research NBS, 26, 405 (1941) RP1386.

[d] 1-g sample burned in oxygen at 1,400° C, and sulfur dioxide absorbed in starch-iodine solution. The iodine was liberated from iodide by titration, during the combustion, with standard KIO_3 solution based on 93 percent of the theoretical factor.

[e] Double dehydration with intervening filtration.

[f] Persulfate oxidation and potentiometric titration with ferrous ammonium sulfate.

[g] Vanadium separated from the bulk of iron in a 10-g sample by selective precipitation with sodium bicarbonate, then oxidized with HNO_3 and titrated potentiometrically with ferrous ammonium sulfate.

[h] Sulfide-iodine method. See BS J. Research, 8, 309 (1932) RP415.

[i] Titrating solution standardized by use of a standard steel.

[j] $Na_2S_2O_3$ precipitation, finished by electrolysis.

[k] Perchloric acid oxidation.

[l] Barba method.

[m] Vanado-molybdiphosphate photometric method.

[n] Absorbed in ammoniacal cadmium chloride.

[o] Absorbed in $AgNO_3$ solution and titrated with NaOH solution standardized with standard steels.

[p] Molybdisilicate photometric method.

[q] Diethyldithiocarbamate photometric method.

[r] Silico-molybdenum-blue photometric method.

[s] Perchloric acid dehydration.

[t] Finished by electrolysis.

[u] CuCNS precipitation, KI–$Na_2S_2O_3$ titration method.

[v] Dimethylglyoxime precipitation, cyanide titration method.

[w] Arsenite titration.

[x] Weighed as ammonium phosphomolybdate.

*LIST OF ANALYSTS

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The steel for the preparation of this standard was furnished by John A. Roebling's Sons Company.

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