U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

OF

STANDARD SAMPLE 19D

ACID OPEN-HEARTH STEEL, 0.2% CARBON

ANALYST*	C	Mn		P		S			Si	COPPER H_2S-CuS-CuO	NICKEL Weighed as nickel dimethylglyoxime	CHROMIUM $FeSO_4$-$KMnO_4$ titration	VANADIUM	MOLYBDENUM Colorimetric	NITROGEN	
	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							
1	0.205	0.450	0.448	0.032	[c] 0.033	0.042	0.040		[d] 0.174	0.163	0.163	[e] 0.039	[f] 0.004	0.017	[g] 0.004	
2	.202		.453	.034	.035	.043	.042		.171	.157	.164	[h] .036	[i] .005	[j] .014		
3	.203	.45			.036	.042	.043	[k] 0.043	[l,d] .170	.150	.160	[e] .038		[j] .015		
4	.205		.442	.036	.037	.041	.042		[d] .176	.157	.158	.037		.012		
5	.205		.453		[m] .035		[n] .042	.041	.169	[o] .154	.166	.042	[p] .005	.017		
	.205		.452		[m] .037		[n] .041		[l] .171	[q] .155	.160	[h] .038	[i] .006	.019		
	.213	[r] .452			[m] .033	[s] .039	[t] .040		[u,d] .174	[q] .174	.17	[e] .042				
8	.203		.445	.033	[m] .034	.041	[t] .040	[v] .041	.174	.158	.164	[e] .038	[p] .004	.018		
9	.204	[w] .448		[x] .036	.036	.041	.041	[v] .042	[y] .174	.157	.159	.043		.020		
Averages	0.205	0.450	0.449	0.034	0.035	0.041	0.041	0.042	0.173	0.158	0.163	0.039	0.005	0.017	0.004	
General average	0.205	0.450		0.034		0.041			0.173	0.158	0.163	0.039	0.005	0.017	0.004	

[a] Precipitated at 40° C, washed with a 1-percent solution of KNO_3 and titrated with alkali standardized by the use of National Bureau of Standards acid potassium phthalate and the ratio 23NaOH: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] Colorimetric method. See J. Research NBS **26**, 405 (1941) RP1386.

[d] Double dehydration.

[e] Persulfate oxidation and potentiometric titration with ferrous ammonium sulfate solution standardized with recrystallized potassium dichromate.

[f] Nitric acid oxidation and potentiometric titration with ferrous ammonium sulfate solution standardized with recrystallized potassium dichromate.

[g] Determination made by M. Marie Cron, by the vacuum-fusion method. See BS J. Research **7**, 375 (1931) RP346.

[h] Perchloric acid oxidation.

[i] Ammonium persulfate-ferrous sulfate-permanganate method.

[j] H_2S-MoO_3.

[k] Absorbed in H_2O_2-NaOH solution. Titrated with H_2SO_4.

[l] Perchloric acid dehydration.

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

[n] Dissolved in HCl(2:1).

[o] Finished by electrolysis.

[p] Colorimetric.

[q] Copper precipitated with $Na_2S_2O_3$. Finished by KI-$Na_2S_2O_3$ titration.

[r] Potentiometric titration with mercurous nitrate.

[s] Precipitated in ferric chloride solution.

[t] Absorbed in cadmium chloride solution.

[u] Hydrochloric acid dehydration.

[v] Sulfur dioxide absorbed in starch-iodide solution. Titration with KIO_3.

[w] Arsenite titration.

[x] Weighed as ammonium phosphomolybdate.

[y] Nitric-sulfuric acid dehydration.

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The steel for the preparation of this standard was furnished by The Midvale Company.

HINGTON, February 10, 1944.

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