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

National Bureau of Standards
Certificate of Analyses

Standard Sample 130A
Steel
(Lead-Bearing)

ANALYST	C	Mn	P		S			Si	Cu	Ni	Cr	V	Mo	Pb	N
	Direct combustion	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)	Combustion Iodate titration	Evolution with HCl (1-1) ZnS-Iodine (theoretical sulfur titer) [b]	Perchloric acid dehydration	Photometric	Weighed as nickel dimethylglyoxime	$FeSO_4$-$KMnO_4$ titration		Photometric	H_2S-$PbMoO_4$	Distillation-titration
1	0.177	[c] 0.758	0.014	[d] 0.015	0.018	[e] 0.018	0.019	[f] 0.172	[g] 0.027 [h] .026	0.009	[i] 0.012	[i] 0.001	0.003	[h] 0.227	[k] 0.007
2	.184	.745	.015	[d] .015	.018		.019	[f] .174	.027	.010	[l] .012	[e] .002	.004	.229	[m] .009
3	.179	[n] .757	[o] .017	.017		[n] .019	.018	[f] .170	[p] .029	[q] .009 .007	[i,n] .011	[i,n] .001	.004	.228	[m] .009
4	.184	.747	.016	[n] .016	.018	[n] .019		[f] .178	[h] .024	[r] .012	.011	[e] .002	.002	.223	.009
5	.179	[n] .752	.015	.016	.018	[s] .019	.018	[f] .173	[t] .028	.008	.013	< .001	.004	.225	.008
6	.185	[n] .755 [q] .753	.015	.016	.020	[u] .019	.021	[f] .176 [v] .176	[w] .026	[q] .010	[l] .013	[x] .001	.005	.231	[k] .008
7	.188	[n] .752		.016		.019		[f] .175	[h] .024	.009	.010	[y] .002	.004	[h] .229	.008
8	.177	.759	.014	.016	.020	.021	.021	[f] .169 [z,f] .168	[t] .032	[q] .011 .010	.010	< [z1] .001	.002	.227	[m] .007
Average	0.182	0.753	0.015	0.016	0.019	0.019	0.019	0.173	0.027	0.010	0.012	0.001	0.004	0.228	0.008
General average	0.182	0.753	0.016		0.019			0.173	0.027	0.010	0.012	0.001	0.004	0.228	0.008

[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 with sodium oxalate through $KMnO_4$ and $Na_2S_2O_3$ and the use of the ratio 2I:1S.

[c] Potentiometric titration.

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

[e] 1-g sample burned in oxygen at 1,425° C and sulfur dioxide absorbed in starch-iodide solution. Iodine liberated from iodide by titration, during the combustion, with standard KIO_3 solution. Titer based on 93 percent of the theoretical factor.

[f] Double dehydration with intervening filtration.

[g] Diethyldithiocarbamate-photometric method. See J. Research NBS **47**, 380 (1951) RP2265.

[h] H_2S-electrolytic method.

[i] Chromium separated from the bulk of the iron by hydrolytic precipitation with $NaHCO_3$, oxidized with persulfate, and titrated potentiometrically with ferrous ammonium sulfate.

[j] Vanadium separated as in (i), oxidized with HNO_3, and titrated potentiometrically with ferrous ammonium sulfate.

[k] Sulfuric acid digestion for 4 hr of a 0.5-g sample. See J. Research NBS **43**, 201 (1949) RP2021.

[l] Diphenylcarbazide-colorimetric method.

[m] Semimicro distillation—Nessler photometric method. See Ind. Eng. Chem. Anal. Ed., **14**, 137 (1942).

[n] Titrating solution standardized with a standard steel.

[o] Weighed as ammonium phosphomolybdate.

[p] Copper-ammonia complex photometric method.

[q] Photometric method.

[r] Dimethylglyoxime precipitate titrated with cyanide.

[s] Sulfur gases absorbed in H_2O_2, and H_2SO_4 titrated with standard NaOH using bromcresol-green indicator.

[t] H_2S-CuO. Copper reprecipitated with $Na_2S_2O_4$ and titrated with KI-$Na_2S_2O_3$.

[u] Sulfur gases absorbed in neutral H_2O_2 and titrated with sodium borate.

[v] Silicomolybdate photometric method. See Anal. Chem., **21**, 589 (1949).

[w] Copper separated as the sulfide from a 10-g sample and determined by the diethyldithiocarbamate-photometric method.

[x] Vanadium precipitated with cupferron and determined by the phosphotungstovanadate-photometric method.

[y] $NaHCO_3$ hydrolysis of a 10-g sample followed by mercury cathode separation. Vanadium titrated with 0.02N $FeSO_4$.

[z] Sulfuric acid dehydration.

[z1] Ether-cupferron separations on a 10-g sample. Vanadium titrated by the $FeSO_4$-$(NH_4)_2S_2O_8$-$KMnO_4$ method.

List of Analysts

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The steel for the preparation of this standard was furnished by the Jones and Laughlin Steel Corporation.

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