Sales 1954 = 480 units

UNITED STATES DEPARTMENT OF COMMERCE

WASHINGTON

National Bureau of Standards

Certificate of Analyses

Standard Sample 12F

Basic Open-Hearth Steel, 0.4% Carbon

ANALYST	C	Mn	P		S			Si	Cu	Ni	Cr	V	Mo	
	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	Evolution with HCl (1–1) ZnS-Iodine (theoretical sulphur titre) [b]	Sulfuric acid dehydration	H_2S–CuS–CuO	Weighed as nickel dimethylglyoxime	$FeSO_4$–$KMnO_4$ titration		Colorimetric	
1	0.452	[c] 0.845	0.015	[d] 0.015		[e] 0.036	0.037	[f] 0.246	0.122	0.060	[g] 0.075	[h] 0.002	0.009	
2	.454	[i] .843		[i] .016		.038	.037	.244	[j] .124	.065	.080	.003	.010	
3	.452	[i] .832	.015	[i] .016	0.038		.036	.247	[j] .118	[k] .062	.070	[l] .003	.011	
4	.446	[i] .836	.015	[i] .017	.038		.037	.245	[j] .120	[k] .062	.074	[l] .002	.010	
	.458	[i] .846	.015	[i] .015	.035	[m] .037		.238	[n] .117	[o] .062	.080	.003	.010	
	.451	[i] .837		[d] .016		[m] .039	[p] .038	[q,f] .249	[r] .126	[o] .060	.072	.003	.009	
7	.450	[s] .834		[i] .014		.037	.035	[q] .241	[t] .123	[o] .062	.075	[u] .002	.010	
8	.452	.827		.016		.036		[q] .242	[j] .119	.061	.076	[u] .003	.011	
Average	0.452	0.838	0.015	0.016	0.037	0.037	0.037	0.244	0.121	0.062	0.075	0.003	0.010	
General average	0.452	0.838	0.015		0.037			0.244	0.121	0.062	0.075	0.003	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] 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-iodine solution. Iodine liberated from iodide by titration, during the combustion, with standard KIO_3 solution based on 93 percent of the theoretical factor.

[f] Double dehydration with intervening filtration.

[g] Chromium separated from the bulk of the iron in a 10-g sample by hydrolytic precipitation with $NaHCO_3$, oxidized with persulfate and titrated potentiometrically with $Fe(NH_4)_2(SO_4)_2$.

[h] Vanadium separated as in (g), oxidized with HNO_3 and titrated potentiometrically with $Fe(NH_4)_2(SO_4)_2$.

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

[j] Finished by electrolysis.

[k] Glyoxime precipitate ignited and weighed as NiO.

[l] Vanadium separated from the bulk of the iron in a 10-g sample by precipitation with cupferron, and titrated by the $FeSO_4$–$(NH_4)_2S_2O_8$–$KMnO_4$ procedure.

[m] Iodate-iodide titrating solution standardized with a standard steel.

[n] CuS precipitated with thiosulfate. Precipitate filtered, dissolved, and titrated by the KI–$Na_2S_2O_3$ method.

[o] Dimethylglyoxime photometric method.

[p] Evolved sulfide absorbed in ammoniacal cadmium chloride.

[q] Perchloric acid dehydration.

[r] Diethyldithiocarbamate photometric method.

[s] Persulfate-photometric method.

[t] KI-$Na_2S_2O_3$ titration.

[u] Vanadium separated from the bulk of the iron in a 10-g sample by precipitation with bicarbonate and titrated by the $(NH_4)_2S_2O_8$-permanganate procedure.

List of Analysts

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

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