UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Certificate of Analyses

Standard Sample 15E
Basic Open-Hearth Steel, 0.1% Carbon

ANALYST	C	Mn		P		S			Si	Cu	Ni	Cr	V	Mo	N
	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)	Combustion	Evolution with HCl (1–1) ZnS-Iodine (theoretical sulfur titre) [b]	Sulfuric acid dehydration	H_2S-CuS-CuO	Weighed as nickel dimethylglyoxime	$FeSO_4$-$KMnO_4$ titration		Photometric	Distillation-titration
1	0.105		[c] 0.440	0.015	[d] 0.016	0.022	[e] 0.021	0.021	[f] 0.085	[g] 0.036	0.036	[h] 0.032	[i] 0.001	0.009	[j] 0.010
2	.103		[k].447	[l].015	.017	.021		.020	[f].086	.037	[m].038	[k].031		.006	
	.106		[k].438		.017	.022		.022	[f].087	.034	[m].043	[k].027		.008	
4	.108		[n].435	[l].017	[d].017	[o].025		.025	.082	.036	[m].034	.030	.001	.008	
5	.108	.44	[k].44	[l].018	[k].017			[p].023	.084	[q].038	[m].037			.007	
6	.106		[k].442		[d].015		[e].022	[p].023	.086	.032	[m].031	[r].029	[s].002	.008	
7	.110		.435	.016	.017	.023	[e].023	[p].023	.087	[q].036	[t].038	.028	[u].001	.006	
Average	0.107	0.44	0.440	0.016	0.017	0.023	0.022	0.022	0.085	0.036	0.037	0.030	0.001	0.007	
General average	0.107	0.440		0.016		0.022			0.085	0.036	0.037	0.030	0.001	0.007	

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

[h] Chromium separated from the bulk of the iron in a 10-g sample by $NaHCO_3$ hydrolysis, oxidized with persulfate, and titrated potentiometrically with ferrous ammonium sulfate.

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

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

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

[l] Weighed as ammonium phosphomolybdate.

[m] Dimethylglyoxime photometric method.

[n] Periodate photometric method.

[o] Meineke method.

[p] Absorbed in ammoniacal cadmium chloride.

[q] KI–$Na_2S_2O_3$ titration.

[r] Chromate photometric method.

[s] Peroxide-HF photometric method.

[t] Glyoxime precipitation-cyanide titration.

[u] Cupferron precipitation-$KMnO_4$ titration.

List of Analysts

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