

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Certificate of Analyses

Standard Sample 10F
Bessemer Steel, 0.4% 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 ₂ P ₂ O 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 titer) ^b	Sulfuric acid dehydration	H ₂ S-CuS-CuO	Weighted as nickel dimethylglyoxime	FeSO ₄ -KMnO ₄ titration		Photometric	Distillation-titration
1	0.420		^o 0.642	0.087	^d 0.085	0.047	^e 0.046	0.047	^f 0.068	^g 0.033	0.019	^h 0.024	ⁱ 0.003	0.010	^j 0.010
2	.420		.634		.086			.047	.067	.032	.020	.023	.004	.008	.010
3	.417	.651	^k .65		^k .087			^l .049	.063	.037	^m .018	.022	.002	.006	
	.417		^k .642	.085	.086	.046	ⁿ .049	^{l, k} .047	^{o, f} .067	.030	.020	.023		.010	^p .010
5	.413		^k .643	.086	{ ^k .087 ^k .086 }	.045	^q .046	.046	{ ^q .067 ^r .069 }	.031	.017	{ ^r .022 ^r .025 }	^t .004	.010	^k .010
6	.415		.636		^d .083		.050		.069			^s .023	^t .003	.009	
Average.....	0.417	0.651	0.641	0.086	0.086	0.046	0.048	0.047	0.067	0.032	0.019	0.023	0.003	0.009	0.010
General average.....	0.417	0.642		0.086		0.047			0.067	0.032	0.019	0.023	0.003	0.009	0.010

^a Precipitated at 40° C, washed with a 1-percent solution of KNO₃ 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 KMnO₄ and Na₂S₂O₃ and the use of the ratio 21:1S.

^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 KIO₃ solution. Titer based on 93 percent of the theoretical factor.

^f Double dehydration with intervening filtration.

^g Diethylthiocarbamate 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 NaHCO₃ hydrolysis, oxidized with persulfate, and titrated potentiometrically with ferrous ammonium sulfate.

ⁱ Vanadium separated as in (h), oxidized with HNO₃ 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 with a standard steel.

^l Absorbed in ammoniacal cadmium chloride.

^m Dimethylglyoxime precipitate ignited to NiO.

ⁿ Sulfur gases absorbed in H₂O₂ and titrated with sodium borate standardized with a standard steel, using methyl red and alphaazurine indicator.

^o HNO₃-H₂SO₄ double dehydration.

^p Micro-Kjeldahl distillation. Finished colorimetrically using Nessler's reagent.

^q Iodate method, standardized with a standard steel.

^r Peroxide-photometric method.

^s Potentiometric titration with ferrous ammonium sulfate.

^t Vanadium oxidized with nitric acid and titrated potentiometrically with ferrous ammonium sulfate.

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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