

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON D.C.

National Bureau of Standards

Certificate of Analyses

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

ANALYST	C	Mn	P		S			Si	Cu	Ni	Cr	V	Mo	N
	Direct combustion	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 Iodate titration ^b	Evolution with HCl (1-1) ZnS-Iodine (theoretical sulfur titer) ^c	Perchloric acid dehydration	H ₂ S-CuS-CuO	Weighed as nickel dimethylglyoxime	FeSO ₄ -KMnO ₄ titration		Colorimetric	Distillation-titration
1.....	0.082	^d 0.388	0.005	^e 0.005	0.032	0.031	0.031	^f 0.042	^g 0.086	0.028	^h 0.010	ⁱ <0.001	0.006	0.005
2.....	.082	.388		.004	.032		.032	^k ^f .042	.084	.025	^l .011	.001	.008	
3.....	.084	^m .388	.007	ⁿ .004	.034	.032		.037	ⁿ .08	ⁿ .025	.007		.004	
4.....	.083	^m .384	.006	^e .006	.029	^m .031		.041	^o .087	.029	.006	^p .002	.004	
5.....	.085	^m .394		.006	.034	^m .033	^q ^r .034 { ^k ^f .040 ^f ^f .042}	^s .085	.032	^l .009	^t <.001	.007		
6.....	.088	^m .395	.005	.006	.032	.034	^r .033	^k ^f .045	^u .086	^v .035	.011	^w .001	.009	
7.....	.082	^m .391	^x .007	.007	.032	.031	^y ^r .034	.045	.088	.029	^z .009	ⁿ .001	.007	
Average.....	0.084	0.390	0.006	0.005	0.032	0.032	0.033	0.042	0.085	0.029	0.009	0.001	0.006	
General average.....	0.084	0.390	0.006		0.032			0.042	0.085	0.029	0.009	0.001	0.006	

^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 23NaOH:1P.
^b 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.

^c Value obtained by standardizing the titrating solutions by means of sodium oxalate through $KMnO_4$ and $Na_2S_2O_3$ and the use of the ratio 2I:1S.

^d Potentiometric titration.
^e Molybdenum-blue photometric method. See J. Research NBS 26, 405 (1941) RP1386.

^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 hydrolytic precipitation with $NaHCO_3$, 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 3 hours of a 1-g sample. See J. Research NBS 43, 201 (1949) RP2021.

^k Sulfuric acid dehydration.

^l Diphenylcarbazide photometric method.

^m Titrating solution standardized with a standard steel.

ⁿ Photometric method.

^o Diethyldithiocarbamate photometric method.

^p $FeSO_4-(NH_4)_2S_2O_8-KMnO_4$ titration.

^q Solution in diluted HCl (1+2).

^r Absorbed in ammoniacal cadmium chloride.

^s Copper-ammonia complex photometric method.

^t Spectrographic determination.

^u Finished by electrolysis.

^v Dimethylglyoxime precipitate titrated with cyanide.

^w Ether separation on a 10-g sample. Vanadium precipitated with cupferron and titrated with $KMnO_4$.

^x Weighed as ammonium phosphomolybdate.

^y Solution in diluted HCl (3+1).

^z Chromium separated as in (h), and oxidized with $HClO_4$.

List of Analysts

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6. J. B. Armstrong, Bethlehem Steel Co., Sparrows Point Plant, Sparrows Point, Md.
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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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A. V. ASTIN, Director.