U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

OF

STANDARD SAMPLE 9D

BESSEMER STEEL, 0.2% 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 final precipitation in reduced solution)	Evolution with HCl (1-1) ZnS-Iodine [b] (theoretical sulfur titre)	Sulfuric acid dehydration	H_2S-CuS-CuO	Weighed as nickel dimethylglyoxime	$FeSO_4$-$KMnO_4$ titration	Colorimetric	Colorimetric		
1	0.200	0.618	0.616	0.095	[c] 0.097	0.035	0.036	[d] 0.033	0.008	0.004	[e] 0.004	[f] 0.006	0.001	[g] 0.018	
2	.198		.62	[h] .100	.099	.039	.038	[i] .029	.007	.004	.003	[j] .005	.003		
3	.200		[k] .623		[k] .097		.039	.030	[l] .011	[m] .003	[m] .005	[m] .006	[m] .001	[n] .015	
4	.205		[k] .621		[k] .098	.036	.034	[o d] .033	[m] .009						
5	.206	.624	.62	.096	.097	.035	[p] .035	[d] .036	.012	.004	[e] .005	[f] .005	.001	[q] .017	
	.204	.618	.619	.095	.096	.036	.036	.035	.010	[m] .004	[m] .004		.001	[q] .018	
	.207		[k] .620		[k] .099		[k] .037	[i] .030	[r] .008	.005	[s] .004	[j] .004	.002		
8	.207		.620	[h] .095	.096	.036	.036	[o d] .032	.011	[m] .005	.007	[k] .01	.003	[n] .017	
9	.205		[k] .620	.096	[k] .097	.038	[k] .038	[i d] .033	.005	.003	.004	.004	.001	[t] .016	
10	.208		.62		.098	.035	.037	.031	[m] .007	[m] .004	.004	[j] .004			
Averages	**0.204**	**0.620**	**0.620**	**0.096**	**0.097**	**0.036**	**0.037**	**0.032**	**0.009**	**0.004**	**0.004**	**0.005**	**0.002**	**0.017**	
General average	**0.204**	**0.620**		**0.096**		**0.036**		**0.032**	**0.009**	**0.004**	**0.004**	**0.005**	**0.002**	**0.017**	

[a] Precipitated at 40° C, washed with a 1-percent solution of KNO_3 and titrated with alkali standardized by the use of National Bureau of Standards acid potassium phthalate and the ratio 23NaOH:1 P.

[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] Colorimetric method. See J. Research NBS 26, 405 (1941) RP1386.

[d] Double dehydration.

[e] Persulfate oxidation and potentiometric titration with ferrous ammonium sulfate solution standardized with recrystallized potassium dichromate.

[f] Nitric acid oxidation and potentiometric titration with ferrous ammonium sulfate solution standardized with recrystallized potassium dichromate.

[g] Determination made by M. Marie Cron, by the vacuum-fusion method. See NBS J. Research 7, 375 (1931) RP346.

[h] Weighed as ammonium phosphomolybdate.

[i] Perchloric acid dehydration.

[j] Ferrous sulfate-persulfate-$KMnO_4$ titration.

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

[l] Finished by electrolysis.

[m] Colorimetric method.

[n] Allen method.

[o] Nitric-sulfuric acid dehydration.

[p] Titrating solution standardized by use of an empirical factor.

[q] Determined colorimetrically following semimicrodistillation.

[r] KI-$Na_2S_2O_3$ titration.

[s] Perchloric acid oxidation.

[t] Solution in sulfuric-phosphoric acid mixture. Distillation and titration.

*LIST OF ANALYSTS

1. Ferrous Laboratory, National Bureau of Standards. Analysis by William Chorney and John P. Hewlett, Jr.
2. S. A. Feldman, Alan Wood Steel Co., Conshohocken, Pa.
3. W. E. Steiner, Bethlehem Steel Co., Johnstown, Pa.
4. E. T. Saxer, Jones & Laughlin Steel Corporation, Otis Works, Cleveland, Ohio.
5. Jones & Laughlin Steel Corporation, H. E. Slocum, director of chemical laboratories. Analysis by Pittsburgh Works, J. D. Ritz, chief chemist.
6. Jones & Laughlin Steel Corporation, H. E. Slocum, director of chemical laboratories. Analysis by Aliquippa Works, D. J. Hallisey, chief chemist.
7. C. G. Hummon, Sheffield Steel Corporation, Kansas City, Mo.
8. D. A. Russell, The Youngstown Sheet & Tube Co., Youngstown, Ohio.
9. O. W. Baldwin, Carnegie-Illinois Steel Corporation, Gary Works, Gary, Ind.
10. C. E. Nesbitt, Carnegie-Illinois Steel Corporation, Edgar Thomson Works, Braddock, Pa.

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

WASHINGTON, March 12, 1943.

LYMAN J. BRIGGS, *Director*.

U. S. GOVERNMENT PRINTING OFFICE 519076