UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards
Certificate of Analyses

Standard Sample 68B
Ferromanganese

ANALYST	Mn	C	P		S			Si	
	Bismuthate ($FeSO_4$–$KMnO_4$)	Combustion	Gravimetric (weighed as $Mg_2P_2O_7$ after removal of arsenic)	Alkali-molybdate	Gravimetric (direct oxidation and final precipitation in reduced solution)	Evolution with HCl ZnS–Iodine (theoretical sulfur titer)[a]	Combustion	Sulfuric acid dehydration	
1	79.96	[b] 6.75	0.285			0.006	[c] 0.005	[d] 0.44	
2	79.91	[e] 6.73		[f] 0.293			[g] .008	.44	
3	[h] 80.00	[i] 6.77		[j] .279	0.005		.004	.43	
4	80.06	[k] 6.77		[l] .297	.005	.007		[l] .44	
	80.00	6.77		[m] .303		[n] .008	[o] .006	.45	
6	79.91	[p] 6.83	.302	[f] .301			[q] .007	.42	
7	79.93 [r] 79.96	6.76	.285	.292	.006	.006	[s] .006	[l] .44	
Average	79.97	6.77	0.291	0.294	0.005	0.007	0.006	0.44	
General average	79.97	6.77	0.293		0.006			0.44	

[a] 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.
[b] Sample mixed with ingot iron. Determination made by Charles C. Marshall.
[c] 1-g sample covered with alundum and burned in oxygen at 1475° C. SO_2 absorbed in starch-iodine solution and titrated with standard KIO_3 solution based on 93 percent of the theoretical factor. Determination made by John L. Hague.
[d] Double dehydration with intervening filtration.
[e] Sample mixed with CuO and electrolytic iron.
[f] Titrating solution standardized by use of a standard steel.
[g] Burned with tin and theoretical factor used for iodate solution.
[h] Manganese dioxide precipitated in nitric acid solution. Solution filtered, and the dioxide titrated with $FeSO_4$ and $KMnO_4$ standardized by use of NBS ferromanganese, 68a
[i] Sample mixed with red lead.
[j] Titrating solution standardized by use of NBS ferromanganese, 68a.
[k] Sample mixed with tin and ingot iron.
[l] Same value obtained by $HClO_4$ dehydration.
[m] Titrating solution standardized by use of NBS acid potassium phthalate, 84d.
[n] KIO_3 standardized by use of NBS Arsenic Trioxide, 83a.
[o] Iodate method with copper used as an accelerator.
[p] Sample mixed with tin.
[q] Burned with tin and SO_2 titrated with iodate standardized by use of a standard steel.
[r] Potentiometric titration with $KMnO_4$ in neutral pyrophosphate solution. See Ind. and Eng. Chem. Anal. Ed. *18*, 191 (1946).
[s] SO_2 absorbed in neutral H_2O_2, solution titrated with Na_2CO_3, using methyl red indicator.

Values for constituents not as accurately determined as the above are: copper, 0.12; chromium, 0.055; vanadium, 0.043; cobalt, 0.04; and arsenic, 0.09 percent.

List of Analysts

R. K. Bell, National Bureau of Standards.
2. J. J. Furey, Electro Metallurgical Company, Niagara Falls, N. Y.
3. W. E. Steiner, Bethlehem Steel Company, Johnstown Plant, Johnstown, Pa.
4. Armco Research Chemical Laboratory, Middletown, Ohio, A. H. Thomas in Charge. Analysis by M. Dannis, L. C. Ikenberry, L. Chenault, and I. Shroyer.
5. O. C. Backstrom, United States Steel Company, Clairton Works, Clairton, Pa.
6. W. F. Lantz, Bethlehem Steel Company, Bethlehem, Pa.
7. Ross L. Harbaugh, Inland Steel Company, Indiana Harbor Works, East Chicago, Ind.

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A. V. ASTIN, *Director.*

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