UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON 25, D. C.

National Bureau of Standards

Certificate of Analyses

Standard Sample 4i
Cast Iron

ANALYST	C		Mn	P		S			Si	Cu	Ni	Cr	V	Mo	Ti	As	N
	Total	Graphitic	Persulfate-Arsenite	Gravimetric (weighed as $Mg_2P_2O_7$ after removal of arsenic)	Alkali-Molybdate [a]	Gravimetric (direct oxidation and final precipitation after reduction of iron)	Combustion	Evolution (HCl, sp. gr. 1.18, ZnS-iodine [b] theoretical sulfur titer [c])	Perchloric acid dehydration	H_2S–CuS–CuO	Weighed as nickel dimethylglyoxime	$FeSO_4$–$KMnO_4$ titration		Photometric	H_2O_2–photometric		Distillation-titration
1	3.25	2.62	[d] 0.790	0.131	[e] 0.133	0.054	[f] 0.052	0.056	[g] 1.45	[h] 0.257	0.065	[i] 0.107	[j] 0.012	0.002	[k] 0.026	[e] 0.018	[l] 0.007
2	[m] 3.25 3.28	2.65	.797		.126	.058	[n] .059		[g] 1.48	.250	.063	[o] .103	[p] .013	.003	[q] .029	[r] .020	.007
3	3.28	2.67	[s] .789		.128	.059		[t] .057	[u,g] 1.47	.255	.065	[v] .100	[p] .012	.003	.026		
4	3.27	2.65	[s] .787	.135	.133	.052	.052	.053	[u] 1.46	[w] .256	.060	[v] .103	[x] .012	.002	.022	[y] .016	.005
5	3.27	2.66	.779	.124	.130	.054		.051	[u] 1.44	[w] .251	.063	[z] .103	[p] .014	.004	.027		
	[m] 3.29 3.27		[s] .797	.132		.053			[g] 1.44	[z1] .25	.061	[o] .106	.013	.004		[y] .017	.008
	3.23	2.63	.797 [z2] .795	.127	.128	.051	[z3] .050 .052		[g] 1.43	[w] .25	.058	.100		.005			.007
8	3.25	2.63	[s] .804	.133	.133	.054	.054		1.44	[z1] .256	.057	.107	.015	.002	.025		.005
Average	3.26	2.64	0.793	0.130	0.130	0.054	0.053	0.054	1.45	0.253	0.062	0.104	0.013	0.003	0.026	0.018	0.006
General average	3.26	2.64	0.793	0.130		0.054			1.45	0.253	0.062	0.104	0.013	0.003	0.026	0.018	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 23 NaOH:1P.

[b] Sample annealed by covering with a layer of graphite, and heating for 20 min. at 685° C.

[c] 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.

[d] Potentiometric titration.

[e] Molybdenum-blue photometric method.

[f] 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.

[g] Double dehydration with intervening filtration.

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

[i] Chromium separated from the bulk of the iron by hydrolytic precipitation with $NaHCO_3$, oxidized with persulfate, and titrated potentiometrically with ferrous ammonium sulfate.

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

[k] Cupferron separation after solution of the sample in diluted HCl (1+2). Vanadium separated by treatment with NaOH.

[l] Sulfuric acid digestion for 3 hr of a 1-g sample. See J. Research NBS **43**, 201 (1949) RP2021.

[m] Gaseometric method.

[n] Combustion gases absorbed in NaOH-H_2O_2, and excess NaOH titrated with H_2SO_4.

[o] Perchloric acid oxidation.

[p] $FeSO_4$-$(NH_4)_2S_2O_8$-$KMnO_4$ method.

[q] Vanadium separated by Na_2CO_3 fusion.

[r] Distillation-H_2S-As_2S_3.

[s] Titrating solution standardized by use of a standard iron or steel.

[t] Solution in diluted HCl (1+1), and sulfide absorbed in ammoniacal cadmium chloride.

[u] Sulfuric acid dehydration.

[v] As in (i), except $FeSO_4$-$KMnO_4$ titration

[w] Finished by electrolysis.

[x] Photometric method.

[y] Distillation-titration.

[z] Diphenylcarbazide photometric method.

[z1] H_2S precipitation-KI-$Na_2S_2O_3$ titration.

[z2] Bismuthate-$FeSO_4$-$KMnO_4$.

[z3] Sulfur gases absorbed in acid H_2O_2 and titrated with sodium borate.

List of Analysts

1. Ferrous Laboratory, National Bureau of Standards. J. I. Shultz in charge. Analysis by R. E. McIntyre, J. R. Spann, E. June Maienthal, and Lorna J. Tregoning.
2. R. H. Elder and R. E. Deas, American Cast Iron Pipe Co., Birmingham, Ala.
3. J. Powell and R. M. Wood, Republic Steel Corp., Birmingham, Ala.
4. H. V. Reddinger, Bethlehem Steel Co., Johnstown Plant, Johnstown, Pa.
5. W. D. Nordling, Grinnell Co., Providence, R. I.
6. R. H. Colin, United States Steel Corp., Duquesne Works, Duquesne, Pa.
7. H. J. Wolthorn, United States Steel Corp., Fairless Works, Fairless Hills, Pa.
8. P. L. Amschler, Allegheny Ludlum Steel Corp., Brackenridge, Pa.

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WASHINGTON, D. C., November 29, 1957. A. V. ASTIN, *Director.*

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