

U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards
 Certificate of Analyses
 OF
 STANDARD SAMPLE 130
 STEEL
 (LEAD-BEARING)

ANALYST*	C	Mn		P		S		Si	COPPER H ₂ S-CuS-CuO	NICKEL Weighed as nickel dimethyl- glyoximate	CHROMIUM FeSO ₄ -KMnO ₄ titration	Pb			MOLYBDENUM
	Direct combustion	Bismuthate (FeSO ₄ - KMnO ₄)	Persulfate Arsenite	Gravimetric (Weighed as MgH ₂ O ₂ after removal of arsenic)	Alkali-molybdate	Gravimetric (Direct oxida- tion and final precipita- tion in reduced solution)	Evolution with HCl (1-1) ZnS-Iodine (theoretical sulfur titre) ^h	Sulfuric acid dehydration				H ₂ S-PbMoO ₄	H ₂ S-Electrolytic	Other methods	
1.....	0.451	0.685	0.689	0.025	0.028	0.021	0.022	0.240 ^e	0.017 ^d	0.008	0.030 ^e	0.206 ^f	0.204 ^g		0.003
2.....	.460		.688	.025	.025	.025	.024	.243 ^h	.019	.008	.028 ⁱ	.198			
3.....	.459		.69	.025	.025	.022	.024	.243 ^o	.015	.009	.027	.206	.200 ^k		
4.....	.448		.694		.026	.024	.022	.236	.020 ^d	.010	.033	.204	.203		
5.....	.454		.694		.027	.022	.022	.233	.019 ^l	.007	.030	.197			
6.....	.456		.69		.028	.024	.024	.237 ^o				.203		.206 ^m	
7.....	.458		.087	.025	.026	.021	.021 ⁿ	.240	.019	.013	.030	.207			
8.....	.453	.685		.025	.027		.025	.233 ^o	.020	.009	.029	.200			
9.....	.460		.688	.023	.023	.020	.019	.241	.014 ^d	.009	.027	.203			
10.....	.448		.690	.026	.025	.021	.021	.236 ^h	.014	.010	.027		.199		
11.....	.450	.681	.690		.026		.022	.230 ^h	.020 ^o	.010	.030			.203 ^p	.002
12.....	.456		.69	.024	.024	.021	.022	.237 ^h	.020 ^o		.025	.201			
13.....	.456		.689	.024	.025	.018	.019 ⁿ	.236 ^o	.017	.008	.027	.202		.202 ^q	
14.....	.45	.687		.025	.026	.018	.019	.231 ^h	.013	.008	.029	.209	.205		
Averages	0.454	0.685	0.690	0.025	0.026	0.021	0.022	0.237	0.017	0.009	0.029	0.203	0.203	0.203	0.003
Recommended values	0.454	0.688		0.025		0.021		0.237	0.017	0.009	0.029	0.204			0.003

^a Precipitated at 40° C, washed with a 1-percent solution of KNO₃ and titrated with alkali standardized by using the National Bureau of Standards standard sample of acid potassium phthalate and the ratio 23 NaOH:1P.
^b Value obtained by standardizing the titrating solution by means of sodium oxalate through KMnO₄ and Na₂S₂O₄.
^c Double dehydration with perchloric acid.
^d Finished by electrolysis.
^e Potentiometric titration.
^f 5-g sample dissolved in 50 ml of diluted HCl (1+1). Solution evaporated just to dryness. Salts dissolved in 300 ml of hot water and lead precipitated as PbS with H₂S. Solution filtered and precipitate washed with diluted HCl (1+99) saturated with

H₂S. Paper and precipitate digested in diluted HNO₃ (1+1) and solution filtered. One g of tartaric acid and 5 ml excess of ammonia added to the filtrate and lead precipitated as PbMoO₄. Solution filtered through a weighed glass-fruit crucible. Precipitate and crucible dried at 130° C.
^g Lead precipitated as PbS in a 5-g sample, and the paper and precipitate digested in 40 ml of diluted HNO₃ (1+1) as in footnote f. Solution filtered, filtrate diluted to approximately 200 ml, and lead deposited electrolytically as PbO₂.
^h Double dehydration with nitric-sulfuric acids.
ⁱ Colorimetric.
^j Titrating solution standardized by the use of a standard steel.

^k Sample dissolved in diluted H₂SO₄ (1+9). Pb precipitated with zinc. Solution filtered, lead dissolved in HNO₃, and deposited electrolytically as PbO₂.
^l Iodide-thiosulfate titration.
^m PbS-H₂SO₄, alcohol-weighed as PbSO₄. (See C. M. Johnson, Metal Progress 85, 384 (1939).)
ⁿ Sample ignited in oxygen, gases passed into H₂O₂, and H₂SO₄ titrated.
^o Thiocyanate method.
^p PbS-PbCrO₄-titrated with thiosulfate.
^q PbS-H₂SO₄, alcohol. Solution filtered, PbSO₄ dissolved in ammonium acetate. Lead precipitated and weighed as PbCrO₄.

LIST OF ANALYSTS*

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| 1. Ferrous Laboratory, National Bureau of Standards. Analysis by John L. Hague and Waimo H. Jukkola. | 9. C. O. Geyer, Inland Steel Co., Indiana Harbor Works East Chicago, Ind. |
| 2. D. A. Russell, The Youngstown Sheet & Tube Co., Youngstown, Ohio. | 10. W. F. Muehlberg, American Steel & Wire Co., Central Laboratory, Cleveland, Ohio. |
| 3. W. H. Warner, Republic Steel Corporation, Youngstown, Ohio | 11. W. D. Brown, Carnegie-Illinois Steel Corporation, Duquesne Works, Duquesne, Pa. |
| 4. W. E. Steiner, Bethlehem Steel Co., Cambria Plant, Johnstown, Pa. | 12. G. P. Burks, Carnegie-Illinois Steel Corporation, Gary Works, Gary, Ind. |
| 5. J. D. Sullivan, A. E. Pavlish, and J. F. Shea, Battelle Memorial Institute, Columbus, Ohio. | 13. L. P. Chase, Carnegie-Illinois Steel Corporation, South Works, Chicago, Ill. |
| 6. C. M. Johnson, Crucible Steel Company of America, Park Works, Pittsburgh, Pa. | 14. T. S. Woodward, Carnegie-Illinois Steel Corporation, Ohio Works, Youngstown, Ohio. |
| 7. G. Dreher, Rotary Electric Steel Co., Detroit, Mich. | |
| 8. American Rolling Mill Company, Research Chemical Laboratory, Arba Thomas in charge; analysis by O. B. Ellis, Middletown, Ohio. | |

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 January 11, 1940.

LYMAN J. BRIGGS,
 Director.