

DEPARTMENT OF COMMERCE

Bureau of Standards

Certificate of Analyses

OF

STANDARD SAMPLE No. 21c

ACID OPEN-HEARTH STEEL, 0.6% CARBON

ANALYST*	C	Mn		P		S		Si	COPPER H <sub>2</sub> S-CuS-CuO	NICKEL Weighed as nickel dimethylglyoxime	CHROMIUM FeSO <sub>4</sub> -KMnO <sub>4</sub> titration	VANADIUM	MOLYBDENUM Colorimetric	ARSENIC
	CARBON Direct combustion	MANGANESE 1. Bismuthate (FeSO <sub>4</sub> -KMnO <sub>4</sub> ) 2. Persulphate Arsenite	PHOSPHORUS 1. Alkali-Molybdate <sup>a</sup> 2. Gravimetric (Weighed as MgP <sub>2</sub> O <sub>7</sub> after removal of arsenic)	1. SULPHUR Gravimetric (Direct oxidation and final precipitation in reduced solution) 2. SULPHUR Evolution with HCl (1:1) ZnS-Iodine (theoretical sulphur titre <sup>b</sup> )	SILICON Sulphuric acid dehydration									
1.....	0.575	0.628	0.627	0.062	0.061	0.029	0.030	0.107	0.052	0.161	0.166 <sup>c</sup>	0.008 <sup>c</sup>	0.004	0.008 <sup>d</sup>
2.....	.570	.635	.635	.063	.062	.030	.031 <sup>e</sup>	.105	.052	.155	.164			
3.....	.577	.636	.640	.063 <sup>f</sup>	.064	.030	.028 <sup>e</sup>	.108	.043 <sup>g</sup>	.153 <sup>b</sup>	.170			
4.....	.570	.625 <sup>i</sup>	.630	.064 <sup>f</sup>		.030 <sup>j</sup>	.030 <sup>e</sup>	.105 <sup>k</sup>	.052 <sup>g</sup>	.17 <sup>l</sup>	.165			
5.....	.571	.632	.624	.059	.059	.031		.111	.057 <sup>g</sup>	.145	.161			
6.....	.58	.625	.62	.062		.030	.029 <sup>e</sup>	.105	.041					
7.....	.57	.635	.635	.063 <sup>f</sup>	.063	.031	.032	.110	.05 <sup>m</sup>	.144 <sup>l</sup>	.17			
8.....	.576	.634	.634	.063		.030	.031	.110	.052 <sup>g</sup>	.150	.165	.005	.007	
9.....	.578	.633		.063	.064 <sup>n</sup>	.030	.031	.103	.048 <sup>o</sup>	.148	.16			
10.....	.572	.625	.62	.064		.031	.031	.108	.05 <sup>m</sup>	.145	.176		.004	
Averages.....	.574	.630	.629	.063	.062	.030	.030	.107	.050	.153	.166	.007	.005	.008
General averages.....	.574	.630		.062		.030		.107	.050	.152	.166	.007	.005	.008

<sup>a</sup> Precipitated at 40° C., washed with 1 per cent KNO<sub>3</sub> and titrated with alkali standardized against Bureau of Standards standard acid potassium phthalate, using the 28:1 ratio.  
<sup>b</sup> Value obtained by standardization of titrating solution against sodium oxalate through KMnO<sub>4</sub> and Na<sub>2</sub>S<sub>2</sub>O<sub>8</sub>.  
<sup>c</sup> Electrometric titration.  
<sup>d</sup> Distillation as AsCl<sub>3</sub>, precipitation as As<sub>2</sub>S<sub>3</sub>, conversion to Ag<sub>3</sub>AsO<sub>4</sub> and titration with KCNS.

<sup>e</sup> Absorbed in cadmium chloride.  
<sup>f</sup> Titrating solution standardized by means of Bureau of Standards standard steel.  
<sup>g</sup> Finished by electrolysis.  
<sup>h</sup> Iron separated with ether, nickel precipitated with dimethylglyoxime, ignited and weighed as oxide.  
<sup>i</sup> Bismuthate-arsenite.  
<sup>j</sup> Precipitated in FeCl<sub>3</sub> solution.  
<sup>k</sup> Nitro-sulphuric method.

<sup>l</sup> Nickel dimethylglyoxime dissolved and titrated with KCN.  
<sup>m</sup> Thiocyanate precipitation method, "Methods of the Chemists of The United States Steel Corporation" for the Sampling and Analysis of Alloy Steel, pp. 65-66.  
<sup>n</sup> Weighed as ammonium phosphomolybdate.  
<sup>o</sup> Precipitated with Na<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, CuS-CuO, finished by titration with KCN.

\* LIST OF ANALYSTS

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|---|---|
| 1. Ferrous Laboratory, Bureau of Standards, H. A. Bright in charge; analysis by R. M. Fowler. | 7. L. P. Chase, Illinois Steel Co., South Works, Chicago, Ill.                |
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| 4. W. F. Lantz, Bethlehem Steel Co., Bethlehem, Pa.   | 10. W. D. Brown, Carnegie Steel Co., Duquesne Works, Duquesne, Pa.            |
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This standard is not recommended for colorimetric carbon determinations, because of uncertainty as to the condition of the carbon.

Washington, D. C.  
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Director.