

U.S. DEPARTMENT OF COMMERCE  
WASHINGTON 25, D.C.

National Bureau of Standards  
Certificate of Analyses  
Standard Sample 341  
Ductile Cast Iron

ANALYST	C		Mn	P		S		Si	Cu	Ni	Cr	V	Mo	Ti	Mg
	Total	Graphitic	Persulfate-Arsenite	Gravimetric (weighed as $Mg_2P_2O_7$ after removal of arsenic)	Alkali-Molybdate <sup>a</sup>	Gravimetric (direct oxidation and final precipitation after reduction of iron)	Combustion-Iodate titration	Perchloric acid dehydration		Weighted as nickel dimethylglyoxime	$FeSO_4$ - $KMnO_4$ titration		Photometric	$H_2O_2$ photometric	
1.....	1.81	<sup>b</sup> 1.21	<sup>c</sup> 0.91	0.021	<sup>d</sup> 0.023	0.008	<sup>e</sup> 0.005	<sup>f</sup> 2.43	<sup>g</sup> 0.151	<sup>h</sup> 20.29	<sup>i</sup> 1.99	<sup>j</sup> 0.012	0.011	<sup>k</sup> 0.018	<sup>l</sup> 0.067
2.....	<sup>m</sup> 1.79	1.24	<sup>n</sup> .90	<sup>o</sup> .022		.005		2.44	<sup>p</sup> .159	<sup>q</sup> 20.30	1.99	<sup>r</sup> .011	.008	.019	{ <sup>s</sup> .070 <sup>t</sup> .066
3.....	1.82	1.21	.92		.027	.008	<sup>u</sup> .008	2.45	<sup>v</sup> .149	<sup>w</sup> 20.35	<sup>x</sup> 1.95	<sup>y</sup> .013	.008	.016	<sup>z</sup> .064
4.....	1.81	1.22	<sup>aa</sup> .91	.022	.022	.007	.007	<sup>ab</sup> 2.46	<sup>ac</sup> .153	20.31	<sup>ad</sup> 1.95	<sup>ae</sup> .010	.012	.020	<sup>af</sup> .070
5.....	1.85		<sup>ag</sup> .94		.030		.011	2.44	<sup>ah</sup> .157	<sup>ai</sup> 20.37					<sup>aj</sup> .068
6.....	1.80	1.24	<sup>ak</sup> .91		<sup>al</sup> .021		<sup>am</sup> .006	<sup>an</sup> 2.45	<sup>ao</sup> .151	<sup>ap</sup> 20.32	1.99		.010		<sup>aq</sup> .070
7.....	1.78	1.24			<sup>ar</sup> .026	.006	<sup>as</sup> .006	2.40	<sup>at</sup> .145		2.02	<sup>au</sup> .016			<sup>av</sup> .070
Average....	1.81	1.23	0.92	0.022	0.025	0.007	0.007	2.44	0.152	20.32	1.98	0.012	0.010	0.018	0.068
General average..	1.81	1.23	0.92		0.024		0.007	2.44	0.152	20.32	1.98	0.012	0.010	0.018	0.068

<sup>a</sup> 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.

<sup>b</sup> Sample treated with  $HNO_3$  (Sp. gr. 1.20), filtered and washed. Residue digested with HCl (Sp. gr. 1.19), filtered, washed, dried and burned.

<sup>c</sup> Potentiometric titration.

<sup>d</sup> Molybdenum-blue photometric method. See J. Research NBS 26, 405 (1941) RP1386.

<sup>e</sup> 1-g sample burned in oxygen at 1,450° 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.

<sup>f</sup> Double dehydration with intervening filtration.

<sup>g</sup> Diethyldithiocarbamate photometric method. See J. Research NBS 47, 380 (1951) RP2265.

<sup>h</sup> Nickel precipitated with dimethylglyoxime from an aliquot portion of a 2-g sample.

<sup>i</sup> Persulfate oxidation, potentiometric titration with  $FeSO_4$ .

<sup>j</sup> Mercury cathode- $HNO_3$  oxidation, potentiometric titration with  $FeSO_4$ .

<sup>k</sup> Cupferron separation after solution of the sample in diluted HCl (1+2). Vanadium separated by treatment with NaOH.

<sup>l</sup> Ether separation on a 10-g sample. Magnesium precipitated as phosphate.  $Mg_2P_2O_7$  corrected for calcium and manganese.

<sup>m</sup> Gasometric method.

<sup>n</sup>  $KIO_4$  photometric method.

<sup>o</sup> Weighed as ammonium phosphomolybdate.

<sup>p</sup> Electrolytic method.

<sup>q</sup> Dimethylglyoxime-electrolytic method after removal of copper.

<sup>r</sup> Spectrochemical determination.

<sup>s</sup> Magnesium precipitated as phosphate.

<sup>t</sup> Sulfur gases absorbed in NaOH- $H_2O_2$  solution and excess NaOH titrated with  $H_2SO_4$ .

<sup>u</sup>  $H_2S$ - $CuS$ - $CuO$ .

<sup>v</sup> Dimethylglyoxime-nickel oxide method.

<sup>w</sup> Perchloric acid oxidation.

<sup>x</sup>  $FeSO_4$ -( $NH_4$ ) $_2$  $SO_4$ - $KMnO_4$ .

<sup>y</sup> Ether separation. Magnesium precipitated as phosphate.

<sup>z</sup> Ether-cupferron separation on a 10-g sample. Vanadium titrated with  $KMnO_4$ .

<sup>aa</sup> ZnO-Bismuthate method.

<sup>ab</sup> Bismuthate ( $FeSO_4$ - $KMnO_4$ ) method.

<sup>ac</sup> Titrating solution standardized by the use of a standard iron or steel.

### List of Analysts

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The iron for the preparation of this standard was furnished by The International Nickel Co., Inc.

WASHINGTON, D.C., March 26, 1962

U.S. GOVERNMENT PRINTING OFFICE 637942

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