

U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

OF

STANDARD SAMPLE 156
CHROMIUM-NICKEL-MOLYBDENUM STEEL
(N.E. 9450)

ANALYST*	C	Mn		P		S			Si	Ni	Cr	Mo				
	Direct combustion	Bismuthate (FeSO ₄ -KMnO ₄)	Persulfate-Arsenite	Gravimetric (weighed as Mg ₂ P ₂ O ₇ after removal of arsenic)	Alkali-Molybdate ^a	Gravimetric (direct oxidation and precipitation after reduction of iron)	Evolution (HCl sp gr 1.18-ZnS-iodine - theoretical sulfur titer) ^b	Combustion	Sulfuric acid dehydration		COPPER H ₂ S-CuS-CuO			Weighted as nickel dimethylglyoxime	FeSO ₄ -KMnO ₄ titration	VANADIUM
1.....	0. 513	1. 40	1. 39	0. 033	^c 0. 032	0. 017	0. 018		^d 0. 226	0. 050	0. 474	^e 0. 427	^f 0. 002	^g 0. 137	0. 138	
2.....	. 510		1. 40		. 031	. 017		^h 0. 017	ⁱ . 218	^j . 051	. 481	. 432		^k . 134	. 136	
3.....	. 515	^l 1. 41			. 031	. 017	. 017		. 229	^m . 056	. 472	. 434		ⁿ . 143	. 144	
4.....	. 526		1. 40	^o . 032	. 032		. 016	^p . 016	^q . 22	^r . 053	. 48	^s . 43		^t . 135		
5.....	^u . 517		1. 42		^v . 031	. 018		^w . 019	^x . 225	. 051	. 470	. 422		^y . 137	. 134	
	. 516		^{aa} 1. 42	^{ab} . 032	^{ac} . 031		^{ad} . 019		^{ae} . 231	^{af} . 056	. 467	. 421		^{ag} . 139	. 132	
	. 519	^{ah} 1. 41	1. 41		. 029	. 018	. 017		^{ai} . 224	^{aj} . 053	. 464	. 422		^{ak} . 139	. 140	
	. 518		^{al} 1. 40	. 033	^{am} . 033	. 017	. 016		^{an} . 224	. 054	. 480	. 429		^{ao} . 142		
9.....	. 519		1. 41	. 032	^{ap} . 033	. 018	. 018	^{aq} . 018	^{ar} . 219	. 049	. 475	^{as} . 437		^{at} . 139	. 138	
10.....	. 507	1. 38	^{au} 1. 40	. 031	. 031		^{av} . 018		^{aw} . 231	^{ax} . 053	. 476	. 428			. 137	
11.....	. 508	^{ay} 1. 38	1. 39		. 032			^{az} . 018	^{ba} . 228	^{bb} . 051	. 481	. 435			. 138	
12.....	. 515		^{bc} 1. 39	. 031	. 030		. 018	^{bd} . 019	^{be} . 234	^{bf} . 055	. 474	. 432		^{bg} . 138	. 140	
Averages..	0. 515	1. 40	1. 40	0. 032	0. 031	0. 017	0. 017	0. 018	0. 226	0. 053	0. 475	0. 429	0. 002	0. 138	0. 138	
General average..	0. 515	1. 40		0. 032		0. 017			0. 226	0. 053	0. 475	0. 429	0. 002	0. 138		

^a Precipitated at 40° C, washed with a 1-percent solution of KNO₃ and titrated with alkali standardized by the use of acid potassium phthalate and the ratio 23NaOH:1P.

^b Value obtained by standardizing the titrating solution by means of sodium oxalate through KMnO₄ and Na₂S₂O₃, and use of the ratio 21:18.

^c Molybdenum-blue photometric method. See J. Research NBS 26, 405 (1941) RP1386.

^d Double dehydration.

^e Persulfate oxidation and potentiometric titration with ferrous ammonium sulfate.

^f Nitric acid oxidation and potentiometric titration with ferrous ammonium sulfate.

^g α-Benzoinoxime method. See BS J. Research 9, 1 (1932) RP453.

^h Sulfur dioxide absorbed in starch-iodine solution. Titration with KIO₃ solution.

ⁱ Nitric-sulfuric acid dehydration.

^j KI-Na₂S₂O₃ titration.

^k NaOH separation, molybdenum precipitated and weighed as PbMoO₄.

^l Titration with arsenite solution.

^m Finished by electrolysis.

ⁿ H₂S-MoO₃ method.

^o Weighed as ammonium phosphomolybdate.

^p Sulfur evolved as H₂S by passing H₂+HCl over drillings at 950° to 1,000° C.

^q Perchloric acid dehydration.

^r Glyoxime-cyanide titration method.

^s Differential-gasometric after sodium hydroxide treatment of exit gases.

^t Titrating solution standardized by use of a standard steel.

^u Sulfur gases absorbed in NaOH-H₂O₂ solution. Titrated with H₂SO₄ solution.

^v Yellow precipitate ignited and weighed as P₂O₅-24MoO₃.

^w Evolution with diluted HCl (1+1).

^x Glyoxime precipitate ignited and weighed as NiO.

^y Chromium removed as PbCrO₄.

^z Copper precipitated as CuCNS and titrated with standard KIO₃ and Na₂S₂O₃.

^{aa} Chromium volatilized as CrO₂Cl₂.

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The steel for the preparation of this standard was furnished by the Republic Steel Corporation.

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E. U. CONDON, Director.