U. S. DEPARTMENT OF COMMERCE

National Bureau of Standards

Certificate of Analyses

OF

STANDARD SAMPLE 73A

STAINLESS STEEL, 14% CHROMIUM

ANALYST*	C	Mn		P		S			Si	Cu	Ni	Cr	V	Mo	W	N
	Direct combustion	Bismuthate ($FeSO_4$-$KMnO_4$)	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)	Evolution with HCl (1:1) ZnS-Iodine (theoretical sulfur titre) [b]	Combustion	Perchloric acid dehydration	COPPER H_2S-CuS-CuO	NICKEL Weighed as nickel dimethyl-glyoxime	$FeSO_4$-$KMnO_4$-titration	VANADIUM	MOLYBDENUM Colorimetric	TUNGSTEN	NITROGEN
1	0.346	[c] 0.245	[d] 0.250	0.014	[e] 0.014	0.031	0.028		[f] 0.310	0.083	0.161	[g] 14.07	[h] 0.027	0.069	0.094	[i] 0.035
2	.355		[d] [j] .253		[j] .014	.030		[k] 0.033	.305	[l] .082	.163	[m] 14.15	.032	.074		[n] .035
3	.341		[e] .242		.018	.029			.314	[o] .079	.159	14.07		.061		
4	.350		[e] .258	[p] .016	.015	[q] .030	[j] .029		.316	[l] .078	[r] .157	[m] [j] 14.15	[h] .030	[s] .072		[t] .031
5	.341	.251	[e] .248		.016	[q] .032		[k] .033	.31	[u] .078	[r] .167	14.07	[v] .029	.07		[t] .039
6	.347		[d] .241	.014	[j] .014	.032		[w] .032	[f] .316	[x] .086	[y] .152	14.11	[z] .028	.083	.092	[z1] .037
7	.348	.245	[d] [j] .25		.016		.030		[f] .318	.088	[y] .16	[m] 14.06	[z2] .025	.074		[z1] .035
	.358	[c] .247	[d] .253		.015	.030	.028	[k] .031	[f] .315	[l] .082	.161	14.04	[v] .025	.067		[z3] .037
	.354		[d] .25	.015	.015			[k] [w] .033	.312	[x] .080		14.10	.030	.061		.038
10	.347		.25		.017		.032		.302	.074	.152	14.04		.065		.034
11	.352		[d] .258		.016			[z4] .028	.303	[u] .075	.158	[g] 14.11	[h] .026	.068	.087	.035
Averages	**0.349**	**0.247**	**0.250**	**0.015**	**0.015**	**0.031**	**0.029**	**0.032**	**0.311**	**0.080**	**0.159**	**14.09**	**0.028**	**0.069**	**0.091**	**0.036**
General average	**0.349**	**0.249**		**0.015**		**0.031**			**0.311**	**0.080**	**0.159**	**14.09**	**0.028**	**0.069**	**0.091**	**0.036**

[a] Precipitated at 40° C, washed with a 1-percent solution of KNO_3 and titrated with alkali standardized by the use of National Bureau of Standards acid potassium phthalate and the ratio 23NaOH:1P.

[b] Value obtained by standardizing the titrating solution by means of sodium oxalate through $KMnO_4$ and $Na_2S_2O_8$, and use of the ratio 2I:1S.

[c] Chromium removed by precipitation with ZnO.

[d] Chromium volatilized as CrO_2Cl_2.

[e] Colorimetric method. See J. Research NBS **26**, 405 (1941) RP1386.

[f] Double dehydration.

[g] Persulfate oxidation, potentiometric titration with ferrous ammonium sulfate standardized with recrystallized potassium dichromate.

[h] Nitric acid oxidation, potentiometric titration with ferrous ammonium sulfate solution standardized with recrystallized potassium dichromate.

[i] Determination made by Vernon C. Holm by the vacuum fusion method. See BS J. Research **7**, 375 (1931) RP346.

[j] Titrating solution standardized by use of a standard steel.

[k] Sulfur gases absorbed in starch-iodide solution and titrated with KIO_3 solution standardized against standard steels.

[l] KI-$Na_2S_2O_3$ titration.

[m] Perchloric acid oxidation.

[n] Solution-distillation method. Sample dissolved in dilute sulfuric acid.

[o] Colorimetric method.

[p] Weighed as $(NH_4)_3PO_4.12MoO_3$.

[q] Meineke's method.

[r] Glyoxime precipitate ignited and weighed as NiO.

[s] Alpha-benzoinoxime method. See BS J. Research **9**, 1 (1932) RP453.

[t] Solution-distillation method. Sample dissolved in dilute HCl.

[u] H_2S-α-benzoinoxime-CuO.

[v] Vanadium separated by electrolysis with a mercury cathode, and finally titrated with potassium permanganate solution.

[w] Sulfur gases absorbed in NaOH-H_2O_2 solution, and excess NaOH titrated with H_2SO_4.

[x] Finished by electrolysis.

[y] Glyoxime precipitate titrated with standard NaCN solution.

[z] Vanadium precipitated with cupferron, and determined by ammonium persulfate-permanganate method.

[z1] Dissolved in H_2SO_4-H_3PO_4. Selenium added and solution fumed. Distillation-titration method.

[z2] Chromium separated as $PbCrO_4$. Vanadium determined by differential titration with $FeSO_4$-$KMnO_4$ using *o*-phenanthroline indicator.

[z3] C. M. Johnson's method. See Iron Age, p. 11 July 26, 1934.

[z4] Sulfur gases absorbed in neutral H_2O_2 solution, titrated with standard NaOH solution.

*LIST OF ANALYSTS

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

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