

British Chemical Standard Certified Reference Material

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P.D. RIDSDALE, *B.Sc., C.Eng., M.I.M.*, (Managing)
B. BAGSHAWE, *A.Met., C.Eng., F.I.M.*
R.P. MEERES, *B.A.*, (Oxon)
W.F. WILSON

Certificate of Analyses

†SS-CRM Nos. 611/1-615/1
LOW ALLOY CAST STEELS

Prepared under rigorous laboratory conditions and, AFTER STANDARDIZATION BY ANALYSTS IN GREAT BRITAIN,
issued by the Bureau of Analysed Samples Ltd.

The bars from which these standards were prepared were specially cast by the Steel Castings Research and Trade Association, Sheffield, who also undertook the spectrographic examination for homogeneity.

CO-OPERATING ANALYSTS AND FIRMS

INDEPENDENT ANALYST

1. PICKERING, J. L., *L.R.I.C.*, Ridsdale and Co. Ltd., Middlesbrough.

ANALYSTS representing PRODUCERS and USERS

2. BOOTH, G. M., Catton and Co. Ltd., Leeds.
3. DOUGHTY, A., APV Paramount Ltd., Crawley.
4. HUGHES, L. T., F. H. Lloyd and Co. Ltd., Wednesbury.
5. KYLE, J. H., *M.I.M.*, Babcock and Wilcox (Operations) Ltd., Renfrew.
6. RICHARDS, J. R. M., *B.Sc., M.I.M., M.I.B.F.*, BSC Hamiltons (Cardiff) Works, Cardiff.
7. SAXBY, A., *A.Met.*, O-H Steelfounders and Engineers Ltd., Sheffield.

Note

These disc samples have been prepared from chill cast bars which were subjected to extensive spectrographic tests to confirm their homogeneity both radially and longitudinally. Slight porosity was detected in the centre of some of the disc samples but spectrographic examination proved that this did not adversely affect the use of these samples as long as they are not sparked directly on to the affected area.

†Spectroscopic Standard - Certified Reference Materials, **only** available in the form of 44mm diameter discs.

ANALYSES
(Mean values)

Sample No.	Analyst No.	C %	Si %	Mn %	Cr %	Mo %	Ni %	V %	S %	Cu %
611/1	1	0.054	0.44	0.39	4.95	0.41	0.50	0.14	...	...
	2	0.054	0.44	0.39	4.94	0.40	0.49	0.14	...	...
	3	0.056	0.42	0.39	4.95	0.39	0.50	0.15	...	...
	4	...	...	0.41	4.96	0.40	0.50	0.14	...	...
	5	0.055	0.44	0.39	4.96	0.41	0.51	0.14	...	...
	6	0.053	0.45	0.42	4.98	0.42	0.51	0.13	<i>0.020</i>	...
	7	0.057	0.44	0.40	4.94	0.42	0.52	0.14	<i>0.020</i>	<i>0.05</i>
	Average	0.055	0.44	0.40	4.95	0.41	0.50	0.14	...	...
612/1	1	0.116	0.28	0.59	4.13	0.80	0.97	0.22	...	...
	2	0.124	0.28	0.59	4.18	0.79	0.96	0.22	...	...
	3	0.121	0.27	0.60	4.11	0.78	0.97	0.21	...	...
	4	...	...	0.62	4.16	0.82	0.96	0.22	...	...
	5	0.118	0.29	0.59	4.15	0.81	0.98	0.21	...	...
	6	0.12-	0.29	0.61	4.10	0.83	0.97	0.19	<i>0.019</i>	...
	7	0.118	0.28	0.60	4.15	0.78	0.95	0.21	<i>0.020</i>	<i>0.06</i>
	Average	0.12-	0.28	0.60	4.14	0.80	0.97	0.21	...	...
613/1	1	0.19	0.59	0.96	1.98	1.04	2.04	0.31	...	...
	2	0.20	0.57	0.96	2.00	1.02	2.03	0.30	...	...
	3	0.20	0.56	0.97	1.96	1.06	1.98	0.30	...	...
	4	...	...	0.98	2.00	1.04	2.00	0.30	...	...
	5	0.19	0.58	0.95	2.00	1.04	2.05	0.30	...	...
	6	0.19	0.59	0.97	2.01	1.07	1.98	0.31	<i>0.024</i>	...
	7	0.20	0.56	0.96	1.99	1.03	2.00	0.31	<i>0.023</i>	<i>0.06</i>
	Average	0.20	0.58	0.96	1.99	1.04	2.01	0.30	...	...
614/1	1	0.42	0.39	1.32	1.18	0.58	3.08	0.28	...	...
	2	0.41	0.38	1.30	1.18	0.59	3.07	0.28	...	...
	3	0.41	0.40	1.31	1.19	0.63	3.00	0.25	...	...
	4	...	...	1.30	1.19	0.62	3.03	0.26	...	...
	5	0.41	0.38	1.31	1.18	0.61	3.09	0.28	...	...
	6	0.40	0.39	1.28	1.18	0.60	3.05	0.27	<i>0.025</i>	...
	7	0.41	0.39	1.31	1.18	0.60	3.04	0.27	<i>0.019</i>	<i>0.06</i>
	Average	0.41	0.39	1.30	1.18	0.60	3.05	0.27	...	...
615/1	1	0.31	0.16	1.68	0.48	0.21	4.01	0.10	...	...
	2	0.31	0.17	1.68	0.47	0.20	4.00	0.08	...	...
	3	0.30	0.18	1.68	0.52	0.21	4.03	0.11	...	...
	4	...	...	1.69	0.51	0.22	4.00	0.10	...	...
	5	0.30	0.17	1.68	0.49	0.22	4.00	0.10	...	...
	6	0.30	0.18	1.69	0.51	0.19	4.02	0.09	<i>0.020</i>	...
	7	0.31	0.16	1.66	0.48	0.22	3.99	0.09	<i>0.018</i>	<i>0.05</i>
	Average	0.30	0.17	1.68	0.49	0.21	4.01	0.10-	...	...

The above figures are those which each analyst has decided upon after careful verification.

Figures in bold type certified, figures in small italic type only approximate.

SS-CRM Nos. 611/1-615/1 LOW ALLOY CAST STEELS

NOTES ON METHODS USED

CARBON

Analysts Nos. 1 and 3 determined carbon by non aqueous titration according to the British Standard Carbon Method 4*. No. 2 used the gravimetric British Standard Carbon Method 1*. Analyst No. 5 used the low pressure British Standard Carbon Method 3*. Nos. 6 and 7 determined carbon by high frequency combustion/infrared absorption.

SILICON

All analysts except No. 3 determined silicon gravimetrically after dehydration with perchloric acid according to the British Standard Silicon Method 1*. No. 3 used the British Standard Silicon Method 4* which involves a photometric determination as molybdenum blue.

MANGANESE

Analysts Nos. 1, 3, 4, 5, 6 and 7 determined manganese photometrically after oxidation with periodate (Nos. 1, 3, 4, 6 and 7) or persulphate/silver nitrate (No. 5). Nos. 1, 3 and 7 followed the procedure of the British Standard Manganese Method 2* and No. 4 that of the Analoid Method No. 58. Analyst No. 2 oxidized the manganese with persulphate/silver nitrate and completed by titration with sodium nitrite.

No. 3 also used atomic absorption spectroscopy and obtained the following values: No. 611/1 0.37%, No. 612/1 0.61%, No. 613/1 0.98%, No. 614/1 1.31%, No. 615/1 1.67%.

CHROMIUM

Analysts Nos. 1, 2, 4, 5 and 7 determined chromium titrimetrically after oxidation with persulphate/silver nitrate. No. 1 followed the procedure of the Analoid Method No. 37 and Nos. 2 and 7 that of the British Standard Chromium Method 1*. No. 3 used the British Standard Chromium Method 1* for Nos. 611/1 and 612/1 and a diphenylcarbazide photometric method for Nos. 613/1, 614/1 and 615/1. Analyst No. 6 used a diphenylcarbazide photometric method.

MOLYBDENUM

All analysts determined molybdenum photometrically as oxythiocyanate. Nos. 1, 5, 6 and 7 used direct methods whereas Nos. 2, 3 and 4 extracted into n-butyl acetate according to the British Standard Molybdenum Method 1*. No. 1 followed the procedure of the Analoid Method No. 42.

NICKEL

Analysts Nos. 1, 3, 5, 6 and 7 determined nickel photometrically with dimethylglyoxime. No. 1 followed the procedure of the Analoid Method No. 44 and Nos. 3 and 7 that of the British Standard Nickel Method 3*. Nos. 2 and 4 precipitated the nickel with dimethylglyoxime and completed by titration with EDTA (No. 2) or cyanide/silver nitrate (No. 4).

VANADIUM

Analysts Nos. 1 and 3 determined vanadium photometrically as phosphovanadotungstate (Scholes, Analyst, 1957, 82, 525). No. 1 followed the procedure of the Analoid Method No. 59. The remaining analysts used the titrimetric British Standard Vanadium Method 1*.

Analyst No. 3 also used atomic absorption spectroscopy and obtained the following values: No. 611/1 0.14%, No. 612/1 0.21%, No. 613/1 0.29%, No. 614/1 0.24%, No. 615/1 0.13%.

SULPHUR

High frequency combustion/infrared absorption.

COPPER

Photometric with biscyclohexanone oxalyldihydrazone.

*Methods for Sampling and Analysis of Iron, Steel and Other Ferrous Metals, B.S. Handbook No. 19, first published 1970 by the British Standards Institution, 2 Park Street, London W1A 2BS.

NEWHAM HALL,
MIDDLESBROUGH,
ENGLAND.

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